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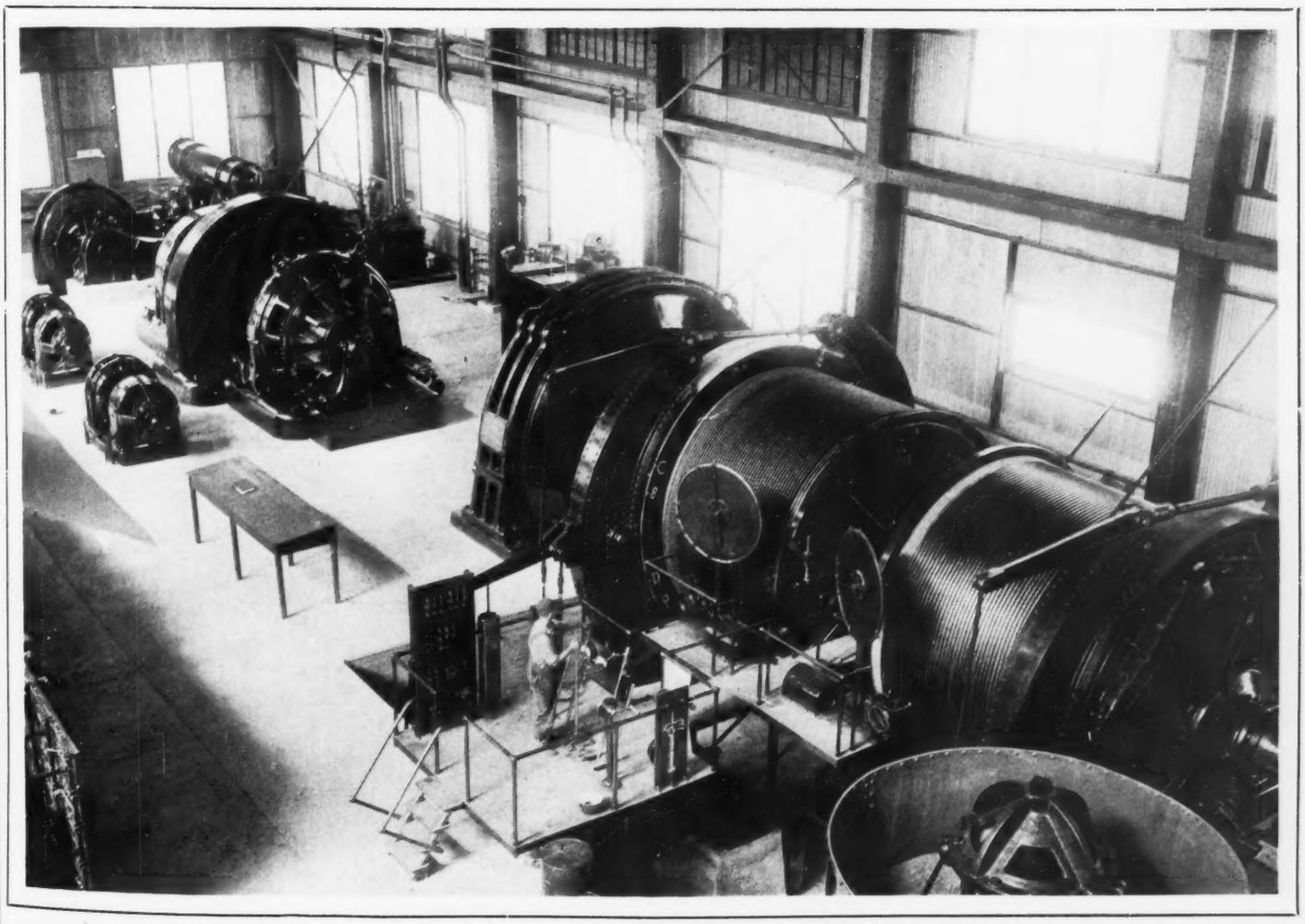
March 21, 1925

Equipment and Operation of Inspiration's New Porphyry Shaft

BY GEORGE H. BOOTH
Mechanical Engineer, Inspiration Consolidated Copper Co., Inspiration, Arizona

Geologic Distribution of Gold

BY T. A. RICKARD

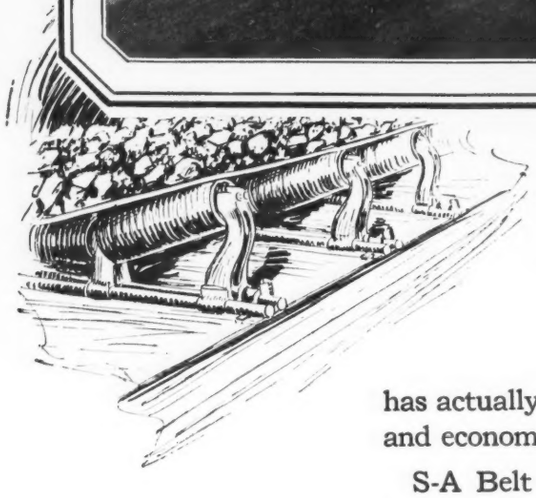


Automatic Hoist at New Porphyry Shaft of Inspiration Consolidated Copper Co., Inspiration, Arizona

It handles two 12-ton skips in balance, raising 600 tons per hour. Horsepower 2150. Rope speed 1830 ft. per minute. The rope is 1⅞ in. in diameter, one of the largest used in a mine. The drums are 12 ft. in diameter, with an 8-ft. face.

Thousands of Tons for Miles

LONGEST BELT CONVEYOR INSTALLATION IN THE WORLD



WHERE large tonnages have previously been handled for great distances from the mine to the tipple it has been the general practice to use the car method.

What new solution? The belt conveyor has now been adapted to this purpose. This method has actually demonstrated that the belt conveyor is the logical and economical means of transporting large tonnages for miles.

S-A Belt Conveyors, 48 inches wide, stretch out for over 4 miles and carry in a continuous stream over 20 tons of run-of-mine coal per minute.

DESIGNERS & BUILDERS OF LABOR SAVING MACHINERY

2

STEPHENS-ADAMSON

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ENGINEERING AND
MINING JOURNAL-PRESS

JOSIAH EDWARD SPURR, Editor

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National Lead's Export Problem

THOSE WHO BELIEVE that a high price level, high wages and a tariff wall mean nothing but a growth of industrial enterprise in the United States, and unbounded prosperity, will do well to ponder over a short paragraph in the 1924 annual report of the National Lead Co., from which we quote as follows: "The company is seriously considering a number of foreign investments. Our wages, administration, and sales expenses in the United States are twice as large as in the companies in which we are interested in Europe. Our export trade is at the vanishing point. If we would continue an important factor in international commerce, we may be compelled to build or buy works in Europe and elsewhere."

Consider what this means. The National Lead Co. is the largest consumer of pig lead in the world. It has investments that carry it into such activities as tin, lead, and zinc mining, smelting and refining and white lead, castor oil, varnish, brass, cartridge, and numerous other manufacturing branches. It has made heavy investments in North and South America and in England. A company with these manifold activities cannot but obtain a viewpoint that is world-wide in its scope, and its reflections and conclusions must be listened to with respectful consideration. Hence, when this great organization virtually confesses its inability to compete for foreign business under present operating conditions in the United States we know that the situation is indeed serious. How much better it would be to build the plants or make the investments which the company is now considering abroad, in the United States, where they will furnish employment to American workmen. Yet what can the corporation do under the circumstances? It is faced with an alternative of having its product completely displaced in foreign markets or meeting this competition on its own ground. Is this tendency of expanding abroad prevalent generally among those American enterprises that have an appreciable export trade? This is the first time that we have noted so gratifyingly frank a statement about the policy of a large company with reference to its export problems. Surely something must be wrong with conditions in this country if they permit a situation such as this to develop.

Canada's Loss

TWO MEN long prominent in Canadian mining circles have recently laid down their work, death taking one, and the other retiring to private life. Both of them were public servants, serving the industry and the people at large in positions that were similar if not identical. Willet G. Miller, Provincial Geologist for Ontario, and once president of the Canadian Mining Institute, passed on in Toronto on Feb. 4, after a distinguished career that had been intimately linked with the history of Cobalt and other famous metal camps of the North. Repeatedly, it is said, he refused offers of more lucrative places with private firms, preferring his public service.

Almost at the same time that Ontario loses Dr. Miller, British Columbia is forced to give up, through his retirement, its Provincial Mineralogist, W. Fleet Robertson, who ceases his work after twenty-seven long and useful years of service to the province. Mr. Robertson is a man of positive opinions and intellectually honest, as T. A. Rickard has written of him—precise and explicit in his statements, a successful engineer and an efficient administrator: qualities of great value in the office he has so well filled.

The Canadian Institute Meeting

THE Canadian Institute of Mining and Metallurgy held a particularly successful annual meeting at Ottawa on March 4, 5, and 6. There were certain innovations over previous meetings. For the second time, ladies were invited to the annual banquet, which thus changed from a stag affair to a society event. Which horn of the dilemma was to be preferred was a subject for grave discussion thereafter. While the previous habit was voted to be too much mining engineer, there were those who believed that the new style was too little mining engineer—if the one was too uncurried, the other was too well saddle-broken. It cannot be said that the annual banquets of the American Institute of Mining and Metallurgical Engineers, based upon the plan followed this year in Canada, have been intense successes. It may be that there cannot be a successful banquet without wine, though of course no one would raise such a question. The present curriculum is plain food, ice water, and speeches. Mining engineers as a body are poor speech makers. They are accustomed to perform rather than to limber up rhetoric, and their natural speech is a mixture of Dawsian and Coolidgian. The ladies, God bless 'em, naturally have small patience with the heroic speech maker: they want to fox-trot. But there is fox-trotting every night, and an annual dinner of mining engineers only once a year. It is a serious as well as a happy occasion.

Canada takes a more friendly interest in its mines and mining engineers than does the United States. The Canadian esprit reminds one of that in the United States some time back, when mining was vital and great things were going on—when American mining engineers were interested in ore deposits and not so exclusively in ore. Canada has a great mining pioneer job yet before it, and is considering it with enthusiasm. The secrets of its vast hinterland have not yet been opened: the known resources have not yet been fully exploited. The government has a kindly and expectant attitude toward mining—an attitude unlike that in the United States, where mining is riper, and more smothered by a vast industrialism, and by the farmer cohorts.

Inspiration's Automatic Hoisting Plants

THE UNITED STATES has long been renowned for the genius of its inventors, who have left no stone unturned when it comes to the design and invention of machinery which will decrease the number of men necessary in the conduct of any productive operation. America has contributed richly to the labor-saving machinery now in use throughout the world. The goal has always been to make every operation as automatic as possible. There is no better example of this tendency in mining engineering than the magnificent plant of the Inspiration Consolidated Copper Co., in Arizona, a company that was the first to introduce the idea of automatic hoisting in shafts, back in 1915. The successful working of the first plant over a period of years has led to the erection of another—the Porphyry plant—also equipped with automatic hoisting machinery. In this issue—pages 477-485—the reader will find a lucid description of the new installation, illustrated with many excellent drawings.

It is an inspiring experience for any engineer, if he has a spark of pride in his profession in him, to stand in the hoist house of the Inspiration main plant and watch the quiet and positive action of the automatic hoisting machinery. The skips are loaded, moved, and dumped with a silence and precision that is almost uncanny, but yet, withal, quite simple in principle. Inspiration is also the first mining enterprise to use in one of its shafts a cage built by an elevator company, a cage which, like an elevator, is controlled in the cage itself. We are sure that the mining engineer who is interested in the advancement of his science will find much useful information in the paper presented. The many men who have had a hand in the design of Inspiration's hoisting plants are to be congratulated for the work they have accomplished and for the freedom with which they have published the results of their work, so that fellow engineers may be advised of the progress made.

Development Association Neglects California Mining

THE California Development Association, an organization formed to function as a state Chamber of Commerce, has been in existence for the last two years, and has started a campaign of advertising to attract new citizens to California. This is commendable enough, but smacks of the cart before the horse. What is wanted is a conscientious nourishing of fundamental industries in the state, to the end that the new citizens who may be attracted will find opportunities for employment. The result of this will be a more substantial growth than can be obtained by the old-time boosting of climate, scenery, and abnormalities.

Conspicuously, the Development Association has neglected mining. This industry contributed $358,745,000 to the wealth of the state in 1924. Agriculture added only a scant $10,000,000 more than this in the same year, and forest products amounted to only one-fourth of the sum given. The mining industry of California has not been prosperous since the war. It is, as a whole, unorganized. Producers of a single mineral commodity are not working together as they should. There is need for co-operative study of the taxation, production, and marketing problems. The gathering together of loose ends can be done by the Development Association. This organization can help not only its own objective, but it can also materially assist the mining industries of the state by selecting a suitable leader to take charge of the activities in this direction. This position requires a well-informed and experienced man who is technically qualified to make investigations and to formulate policies that are sound and progressive.

The Earth Like a Boiled Egg

DOWN in Pennsylvania the newspapers report that a man is going to drill for oil on the theory that the earth is like a boiled egg—the best part in the middle. The deeper he gets, he figures, the better his chances.

This gentleman's theory is close to the accepted theory of the earth's interior. It is undoubtedly true that the center of the earth, and that means the greatest volume of the earth, is metallic. The clues of physics, chemistry, astronomy, and geology all agree in this. An enormous core, it is agreed upon, is probably metallic iron, alloyed with nickel. Outside of this a great shell of silicates mixed with metals, and then the rocks as we know them—the siliceous crust. It is doubtless true that these external igneous rocks, as we know them, from granites to diabases, are peculiar to a thin crust, like the rind of the orange, or relatively thinner. The sedimentary rocks, of course, are, where present, the thinnest veneer, like the skin of an apple. It is generally considered that hand specimens of the material which makes up the earth's interior are supplied by the meteorites which bump into the earth after sailing through unknown space, and which are partly metallic iron alloyed with nickel, partly silicates mixed with metallic iron—forming the so-called pallasite.

The miner naturally passes over the question of iron-nickel alloys to inquire about the hidden treasures of gold, copper, lead, and mercury deep in the earth. Here science is not so sure. Curiously enough, meteorites do not contain these metals, so it may well be that the innermost parts of the earth are barren of them. Yet it is certain that our ore deposits "came from below"—and they would suggest an intermediate source—deep enough, but not in the actual core.

The phenomena of metallographic provinces like those of Arizona, as pointed out by Spurr, argues a region very rich in copper at the base of the zone of active igneous rock magma. Some physicists and chemists and geologists have argued that the earth is like an onion, with the different metals arranged in circular shells, in accordance with their specific gravity. This is probably not the case. The evidence argues a condition intermediate between the two theories above outlined: that outside of the iron core, but at the base of the crust and of the superficial rock magmas, there are regions extremely rich in certain metals. But these regions are probably highly localized, and are very diverse as to the metals represented. They are probably the source whence the metals which we mine are ultimately derived—the "lower down" of our premises.

As to the practical application of this theory, we must unfortunately go slow. That we can ever penetrate by deep exploration into this rich metallic region is practically impossible—certainly impossible in our day and generation. Nevertheless, a correct conception of probable conditions does help us in a practical way, as it would be easy to demonstrate.

Concurrent Roasting of Lead Ores

CONCURRENT or down-draft roasting, in a multiple-hearth furnace, as used at the sulphating plant of the American Smelting & Refining Co. at Durango, Colo., is being tried at at least one lead smelter on ordinary galena ores, preparatory to sintering and smelting in blast furnaces. The experiment, we understand, has not reached the stage where economy has been definitely proved, but the indications are that the sulphur elimination is satisfactory with increased capacity of the furnace, and fuel will be saved.

At Durango the concurrent roast was developed to enable close control of the temperatures, so as to convert sphalerite into the water-soluble form with the minimum production of ferrites. The feed is comparatively low in zinc and high in iron, so that the ordinary roasting process with an up draft would not do. To conduct the concurrent roast, the top of the furnace is inclosed and part of the hot effluent gases is introduced to dry the feed on the top hearth. Ignition on the second hearth is induced by introducing column air that has been heated by passing through the rabble arms. The furnace when once in operation requires no extraneous fuel when roasting as little as thirty tons per day of material with an original sulphur content as low as 20 per cent. The normal capacity is forty tons per day.

Whether any advantage is to be attained in roasting, when no attempt is to be made to recover zinc, remains to be demonstrated. In the meantime, the idea may afford food for cogitation on the part of smeltermen.

Watching the Mud Box

IN A RECENT DISCUSSION of oil geology in the Kern basin of California by Walter Stalder before the San Francisco section of the Institute, Mr. Stalder incidentally brought out the dependence of the oil industry upon the man who watches the mud box. He instanced a case where the man who was responsible for this duty was able to tell from observation alone when the drill had penetrated a water sand or when an oil formation had been cut. He was not, himself, able to detect the slight differences in the appearance of the mud flow which were so plainly evident to the worker. He remarked casually that the man was a mining man. The incident is of value in that it draws attention to a peculiar ability of mining men who may or may not be trained, but who have cultivated the power of keen observation of slight differences. Thus some miners, and even superintendents, through long experience with certain ores, can unerringly discriminate between waste and ore without laboratory tests.

The fate of an oil well may depend upon the keenness of the man who watches the mud box. He is an important adjunct to the geologist, and is well worthy of his hire. However, it is well not to rely too slavishly upon mere observation, and it is necessary repeatedly to check the conclusions obtained in this way by more exact tests. Thus the man who claimed that he could tell the alkalinity of a cyanide solution by rubbing his fingers in it failed to recognize that the same "feel" could be obtained by a cyanide solution containing no alkali. Panning, determination of mud density, microscopic examination, and simple chemical tests that can be rapidly applied are of importance.

Motor Buses Displace Railway Cars

IN VISITING various mining districts throughout the country, one is struck by the wholesale adoption of the motor bus for transportation of passengers, not only between mining camps without rail connections, where automobiles and buses have been popular for several years, but in the last year or two between camps and towns that had acceptable rail service before. In Butte last summer a member of the staff of *Mining Journal-Press* had planned to patronize Anaconda's electric railway in getting out to the smelter town, as he had done in years gone by, but he found that practically all the trains had been taken off and that most elaborately fitted buses were providing better service. Again, in Arizona, the old rail route from Prescott to Jerome, partly along a narrow-gage line that was one of the scenic rides of the country—and all should lament its passing—has been superseded for some time by a more direct motor route across country. Now comes word that the Inspiration company is no longer to take its miners out from Miami on the crooked railroad over which they used to pass; instead six modern buses seating thirty-three persons and costing around $8,000 each are to be used. The passenger automobile, the tractor and the truck have been for some time established as common necessities in practically every mining camp; the motor bus seems to be making itself equally useful.

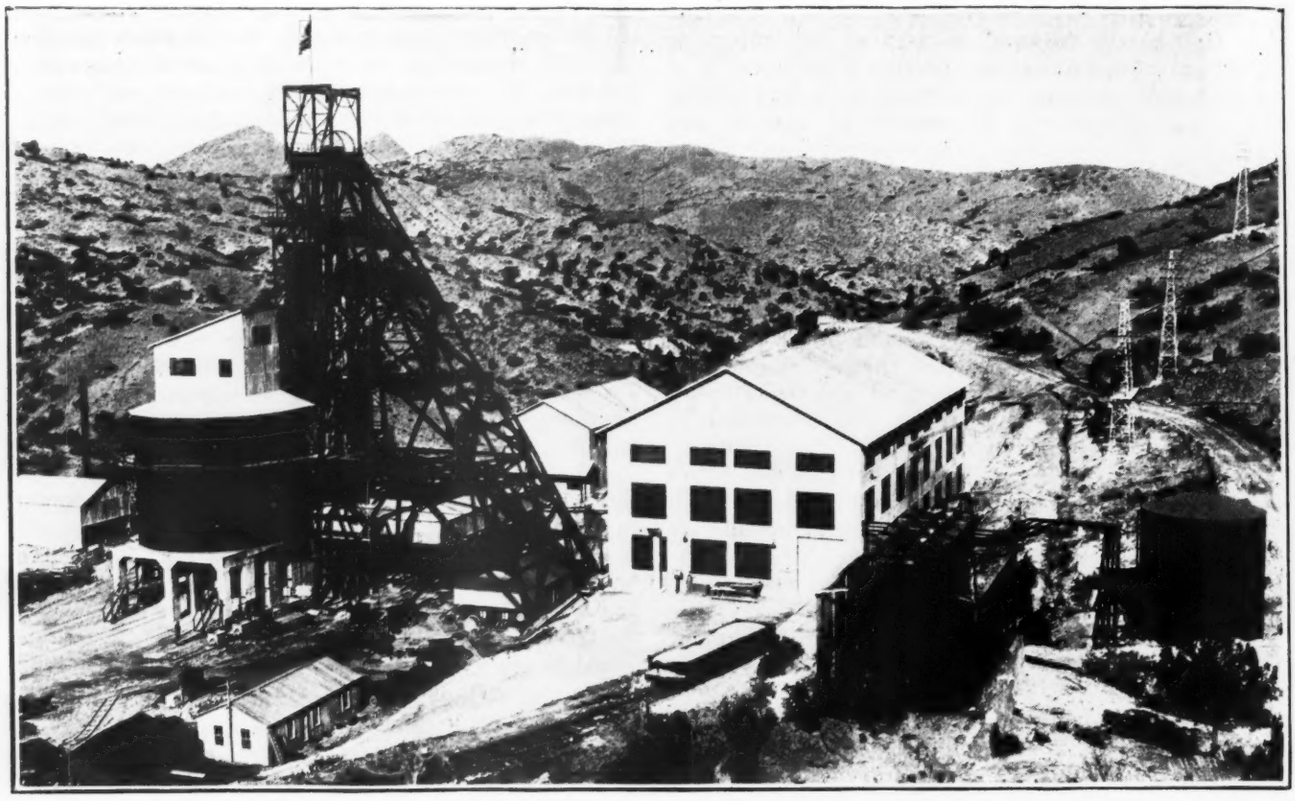
Insularity vs. Open House

E. P. MATHEWSON made a few remarks on the occasion of the Institute's recent visit to the Nichols Copper Works that are worth emphasizing. As the senior member of the party visiting the plant, he warmly thanked the officials of the Nichols company for the hospitality that had been shown the members and the freedom with which information about the conduct of the company's operations was tendered. He appreciated this attitude especially because he had always considered the company as "a hermit nation," seldom, if ever, allowing anyone to visit its plant or exchanging information about its work. The change in spirit was most gratifying to him, and he knew it would be most beneficial to the Nichols company. Drawing from his own long experience in copper smelting, he stated—and this is a significant remark—that he generally received more information and helpful suggestions from the many visitors to the old smelters in Butte and Anaconda than they received in turn from a visit to those plants. An open house paid well in Butte and Anaconda. This is a lesson that some branches of the smelting industry have still to learn, not to mention a few non-metallic mining and producing industries.

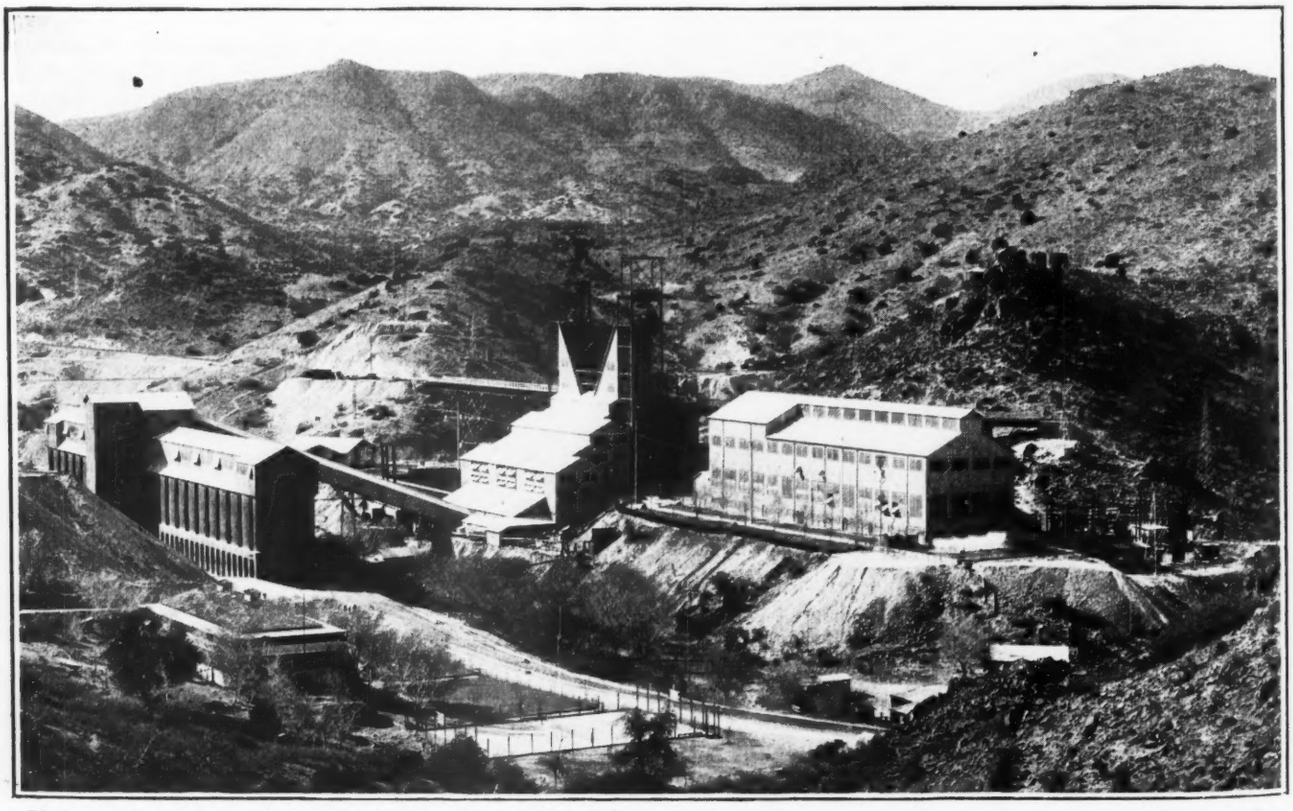
Proposed Legislation in California

THE CALIFORNIA LEGISLATURE has under consideration a bill, Senate Bill No. 137, for the regulation of ore and bullion buying. The provisions of the proposed law follow closely the Colorado statute covering the same subject. The Colorado law has been very efficient, and there is reason to believe that it will be equally efficient if enacted in California. The passage of this bill will be of real benefit to the gold-mining industry of California.

Inspiration's Two Automatically-operated Ore-hoisting Plants



Porphyry shaft of the Inspiration Consolidated Copper Co. From left to right: Ore bins, headframe, change house, hoist house and power line. From this plant the ore is transferred by rail to the crushing plant shown below



Main surface plant of the Inspiration Consolidated Copper Co. The new trestle in the background near the twin headframes leads to the new ore bins and carries the railroad from the Porphyry shaft about 7,000 ft. distant

Equipment and Operation of Inspiration's Porphyry Shaft

The Last Word in Modern Large-Scale Hoisting Practice

By George H. Booth
Mechanical Engineer, Inspiration Consolidated Copper Co., Inspiration, Arizona

UNTIL RECENTLY all ore extracted by the Inspiration Consolidated Copper Co. came from above the 600 level, which is the haulage level supplying the twin main shafts. On Dec. 2, 1924, the first ore from the 1,200 level reached the crushing plant, thus initiating a new supply, to accomplish which Inspiration spent $2,500,000. This development is known as the Porphyry work.

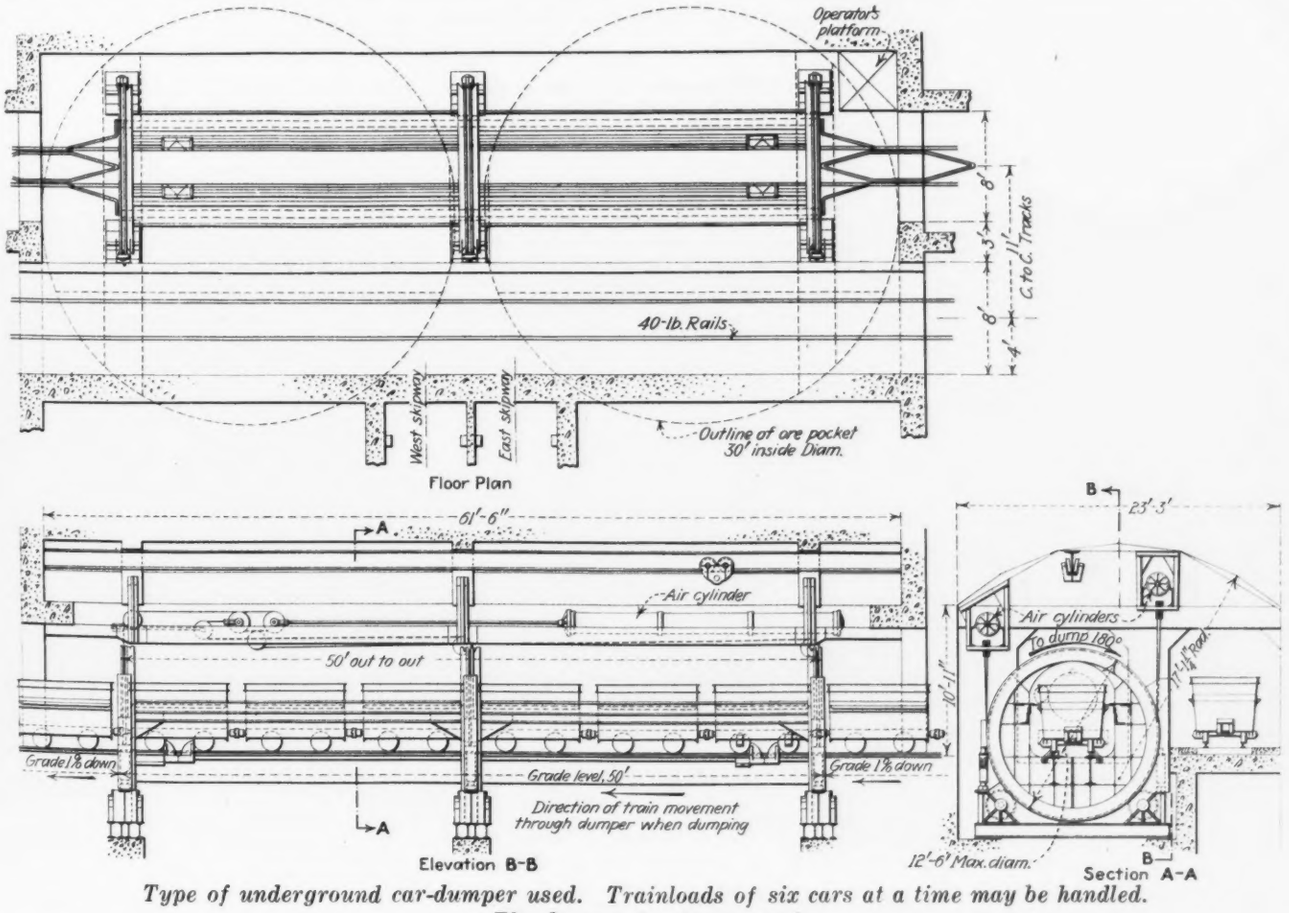
The shaft sunk on property purchased from the Porphyry Copper Co.—hence the name—was described in *Mining Journal-Press* of Feb. 10, 1923. The Live Oak orebody extends below the 600 level, and to reach the bottom of this ore it was necessary to sink a shaft either from the 600 level or from the surface. The latter was done, requiring a complete new plant and railroad, besides extensive work underground.

Briefly, the design called for a shaft 1,400 ft. deep, with three haulage levels serving it; new hoists, compressor, headframe, bins, change house, and a railroad connecting the Porphyry shaft to the existing crushing plant at the main shafts. This work was started in January, 1922, and is now in operation, a period of about three years being required to sink the shaft, concrete it and the twelfth level station, and install the mechanical equipment in both shaft and station.

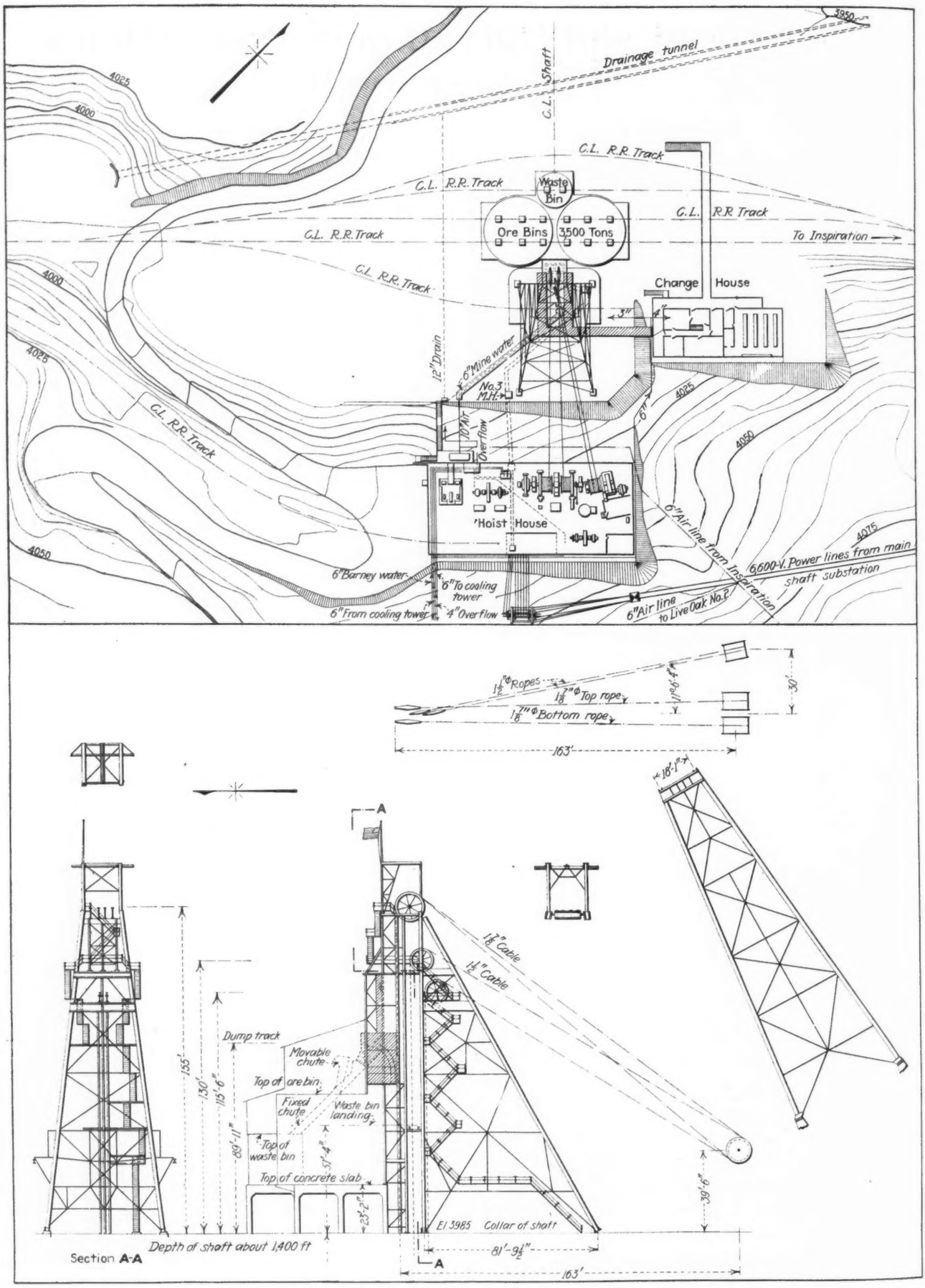
At present the twelfth level is the only one serving the Porphyry shaft with ore, but later the tenth and eighth levels will also be opened and equipped similarly.

On the twelfth level ten-ton air locomotives haul ore trains of eighteen five-ton cars from the ore chutes to the car dumper at the shaft and push the empty train back without uncoupling. The locomotives are the same as used at the main shafts on the sixth level, being charged from a 1,000-lb. air line, and use the air in two cylinders, compounded, at 250-lb. and 50-lb. pressures.

The five-ton cars are also similar to those used heretofore, except that they have swivel couplings which permit cars to be dumped without uncoupling. This not only saves time but eliminates the minor accidents which are unavoidable in the constant coupling and uncoupling of cars in a hurry.



Type of underground car-dumper used. Trainloads of six cars at a time may be handled. The dumper is air operated



Surface plant layout at the Porphyry shaft, showing the arrangement of shaft, ore bins, hoist, change house, and power lines. The general design of the massive headframe is shown on the lower half of the plate

The couplings on both ends of the car are similar, except that at one end two small dowels prevent the turning of that coupling. At this end of the car there is an uncoupling lever, so that when necessary a car may be uncoupled without reaching between the cars. At the other end of the car there is no lever and the coupling is free to turn. Thus, when made up in a train, a fixed and free coupling are together so that when swiveling in the dumper the free coupling is always left in a vertical position, as it is connected to a fixed coupling. This prevents couplings from turning and the pins dropping out, which has in the past been a source of trouble.

The five-ton cars are steel boxes, with cast-iron chilled wheels, and half brasses for bearings, in a packed journal-box, without springs. Inside the bottom of the cars, fastened to the four corners, are heavy chains with some slack, which prevent ore from sticking in the corners or edges, for when the car turns over in the dumper the chains are heavy enough to shake out any ore that would otherwise pack.

The car dumper is operated by two long single-acting air-cylinders with a tail rope connecting the two pistons; the other ends of the piston rods connect with wire cables wrapped around the three supporting rings of the dumper. Six cars are dumped at a time, making a maximum turn of 180 deg. and back. The cars are held in proper alignment by two sets of caging horns, one on the dumper at the far end and the other set just off the near end of the dumper. When the train is spotted correctly, the operator pulls a lever releasing the horns, which then engage the car wheels, thus preventing movement of the train through the dumper while it is turning. When the dumper comes back to position with tracks aligned, the horns are automatically disengaged.

Trains come into the station through the dumper, or if the dumper is occupied the train goes around on the passing track, but all trains leave the station by passing through the dumper.

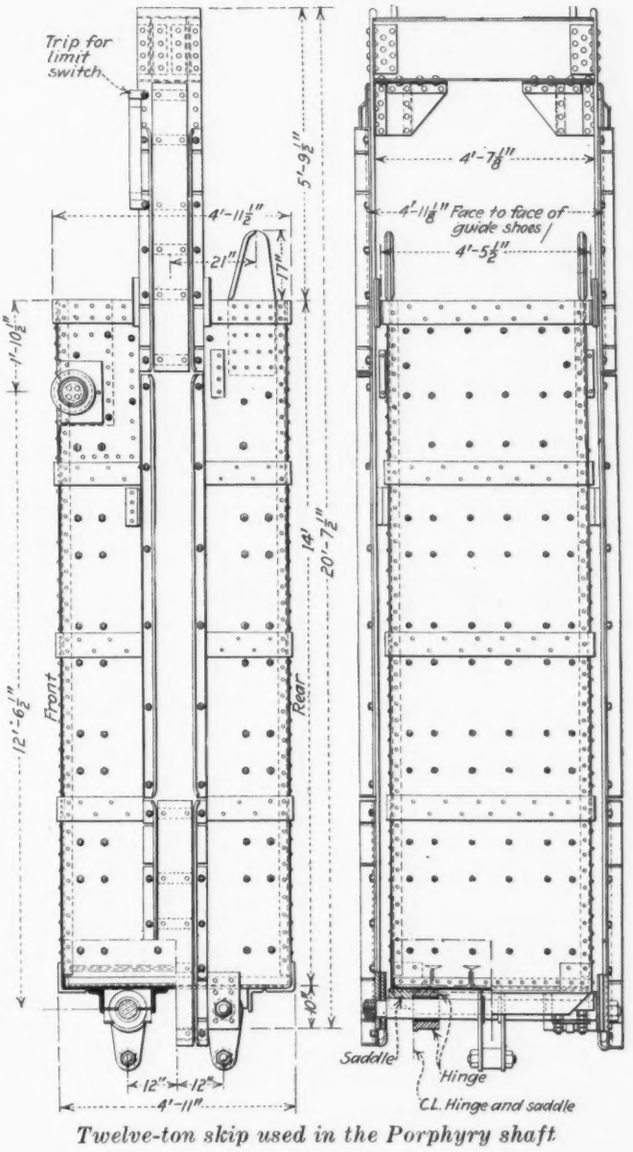
The ore is discharged into two concrete cylindrical bins, 30 ft. in diameter and 40 ft. deep, giving an available storage of 1,600 tons. There is one gate in the bottom of each bin, from which ore is drawn and delivered to the skip by automatic loaders. Manganese-steel pan feeders, 48 in. wide and 7 ft. 6 in. long, draw ore from the gate and discharge it into a loading hopper holding twelve tons, the capacity of the skips.

The loading hopper is balanced on knife edges, like a weighing machine, and counterweighted, so that when twelve tons have been fed into it the hopper settles about $\frac{1}{8}$ in. This movement is multiplied and operates an electric switch, stopping the motor driving the feeder. The descending skip comes to rest on chairs, striking a trigger that releases the latch on the gate of the hopper bottom, and the ore is then delivered from the hopper into the skip.

When the pressure of the ore is removed from the hopper gate, it closes, through the operation of a counterweight, and automatically latches, and at the same time closes the starting switch of the feeder, which again feeds twelve tons into the hopper, leaving it ready to load the skip on its next trip down.

An operator on the loading floor pulls a switch when a skip is loaded, thus starting the ore hoist on the surface, and the trip is made automatically, the skip discharging into the bins on the surface and coming to rest. When the other skip is in turn loaded and hoisted, the first one descends again, the skips working in balance.

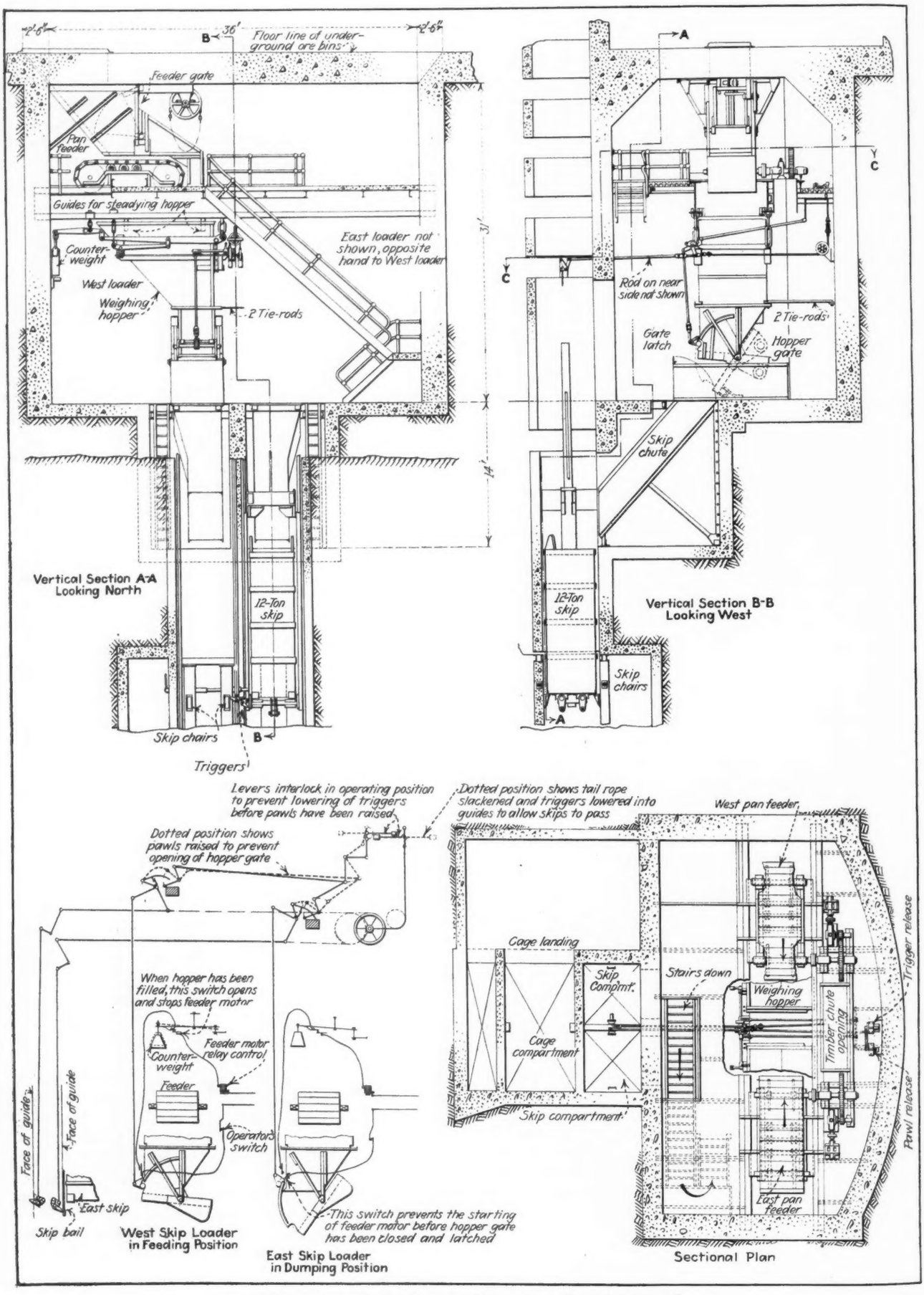
The operator on the loading floor also removes large timbers from the ore at the pan feeders, as timbers would choke the gates in the bottom of the surface bins. The timber thus removed is thrown down a chute to the lower level of the loading station, then carried to the surface in a special car on the cage and used as fuel for the heating boiler of the change house.



Twelve-ton skip used in the Porphyry shaft

The skips come to rest at the loading position, on chairs which are supported on springs, thus relieving the shock on chairs, skip, rope, and chair supports. The chair projecting into the shaft is a steel casting held by three rivets to the piece sliding in guides and supported by the springs. There are four chairs in each skip compartment, one for each corner of the skip. If the skip hits the chairs too hard, the rivets shear, the projecting chairs drop down the shaft, and a serious smash is averted. Spare chairs are kept on hand for quick replacement.

Below the skip chairs in each skip compartment is a spill skip with hinged flaps at the top that lie against

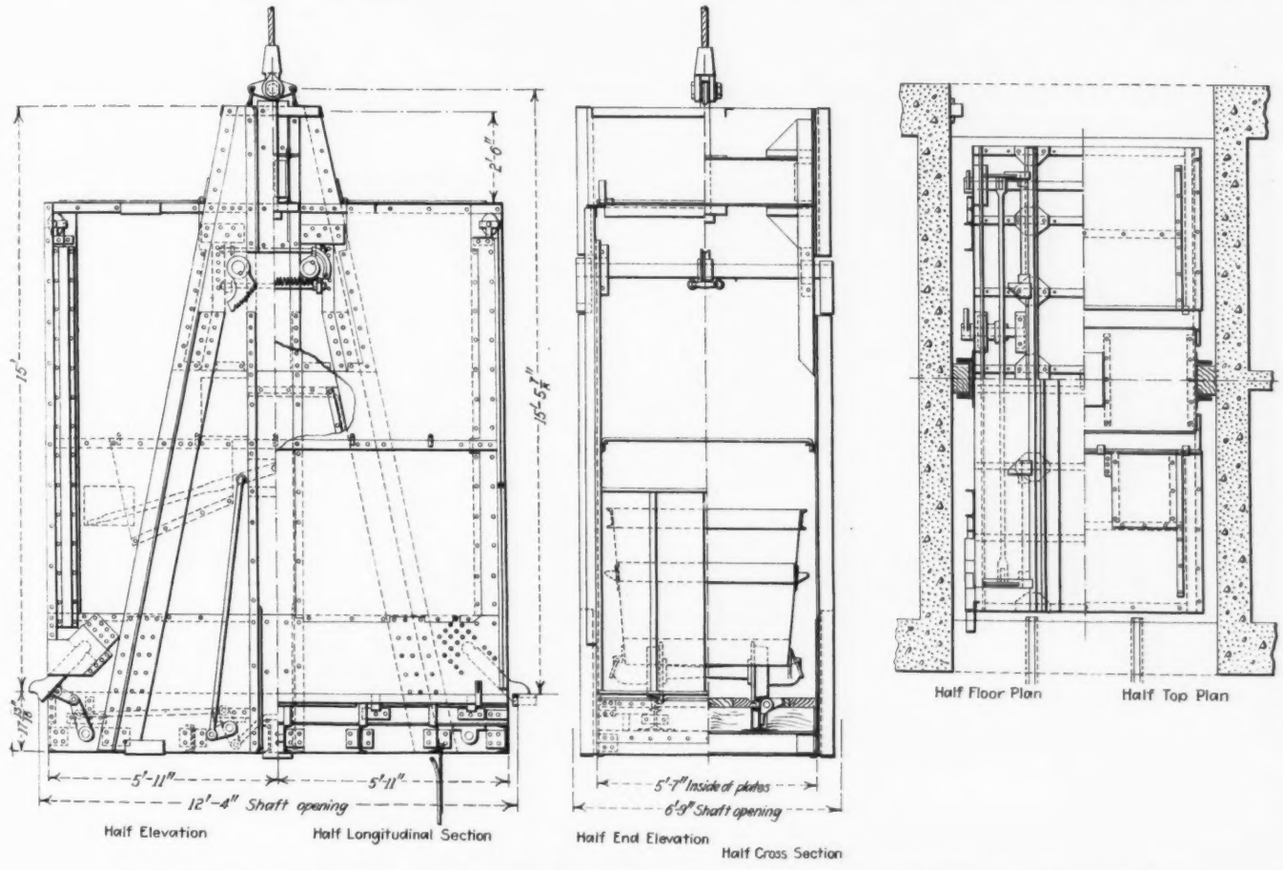


The automatic loading equipment used underground

At the lower left is a diagram showing the principle on which the loader works and the lever actions involved.

the shaft walls, making a hopper opening that catches the dribble from loading. When a spill skip is full, the flaps are folded up and the spill skip is fastened by a cable to the bottom of a twelve-ton skip. It is then hoisted slowly through the chairs to the twelfth-level station and dumped into the ore pocket, through a chute provided for this purpose, by opening a hinged gate in the bottom of the spill skip. Drippings that may pass the spill skip, or ore piled up in the sump due to accident, are cleaned up on the sump level by shoveling into a car, which is then raised on the cage.

The skips dump into two cylindrical steel bins on the surface, 52 ft. in diameter and 43 ft. high, with an accommodates fifty-five men, or a loaded five-ton car. Gates at both ends raise vertically in slides, being counterweighted to move easily, and are latched when closed. At the four corners of the cage are heavy arms that swing out and rest on adjustable blocks at each landing. That is, the cage carries its own chairs, which fold back into position should the cage be hoisted before the cager throws the lever that folds them back into running position. This does away with the possibility of the cage ever running into chairs thrown out into the shaft from a landing. The roof folds back toward the center, thus permitting long pieces to be carried on the deck. A control cable is hung from the bottom of the cage which



Design of the Inspiration cage. It carries its own chairs, is roomy, and excellently adapted for conveying men and materials

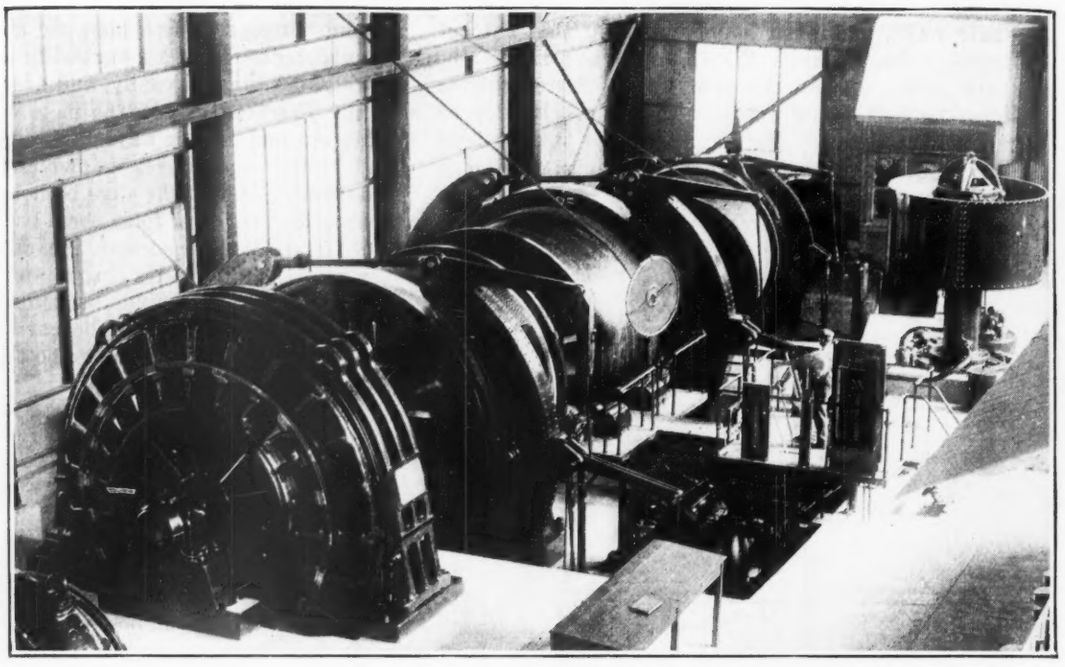
available capacity of 3,500 tons. There is a third cylindrical steel bin for waste, holding 500 tons, at one side of and between the ore bins. Waste will be raised in the skips when the tenth- and eighth-level stations are opened, and by lowering movable chutes over the ore bins the skips can discharge into the waste bin. There are two tracks on the surface under the ore bins where three sixty-ton standard-gage cars can be loaded at one time on each track, by two air-operated gates for each car. One waste car can be loaded at a time under the waste bin.

Waste is hoisted in a regular five-ton mine car on the cage and run around the ore bins and dumped by an electrically operated car dumper into the waste bin. This dumper makes a complete revolution, but only single cars are brought to it. It is driven by an electric motor through clutch and gears.

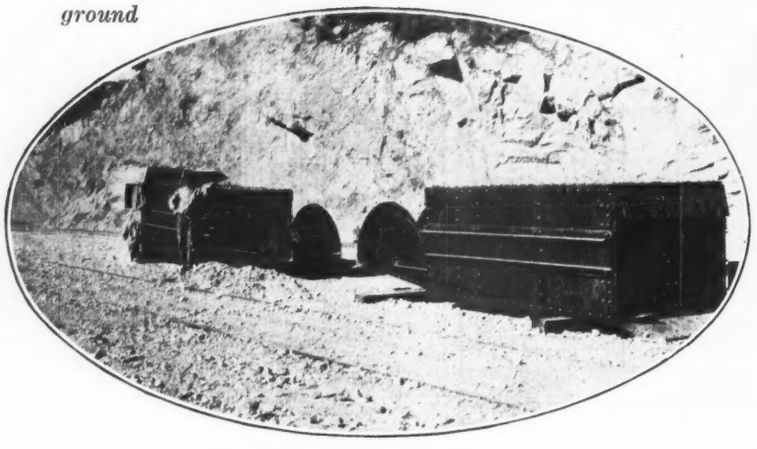
The cage is single deck, 5 ft. 7 in. by 11 ft. 10 in. and permits the cager to give signals while on the cage, even if it be in motion. This control cable also carries a circuit to receive signals and circuits for electric lights and a telephone which are on the cage.

There are two sets of signals, one from the cage to the hoist and another set from all landings to the cage. That is, a call signal can be given from any landing and is received by the cager, whether the cage be in motion or stationary; and the cager signals for the movement of the cage from its deck. This prevents any confusion of signals by the hoist engineer and allows the cager to operate the cage to the best advantage. There is also an emergency set of signal switches at every landing, close to the shaft and inside the landing gates. Should the cage signals be out of order, the landing signals are used, but a signal can be given only from the landing where the cage may be, to the hoist engineer, which again prevents confusion of sig-

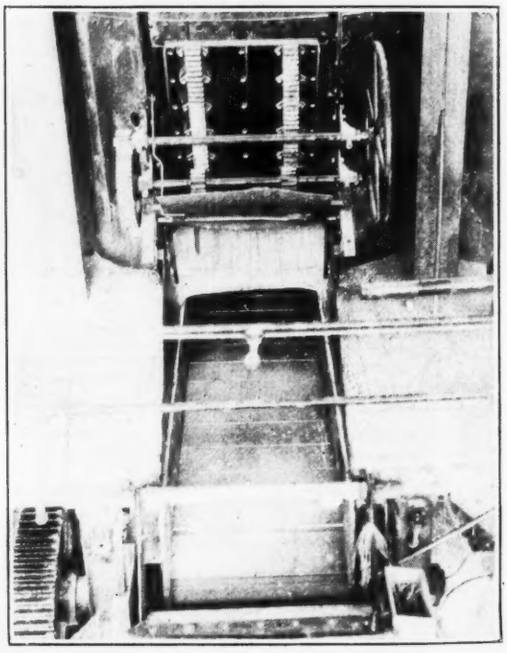
The Porphyry ore hoist built for automatic operation. The engineer for the man hoist in the background is quartered in the soundproof room shown in the rear

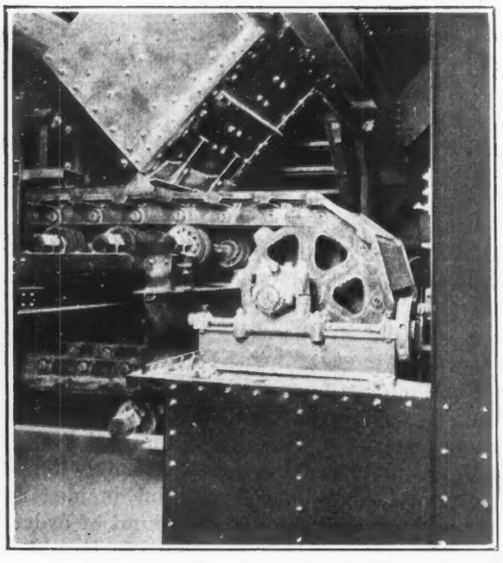


Spill skips used in the Porphyry shaft. They catch the rock which overflows the skips while being loaded underground



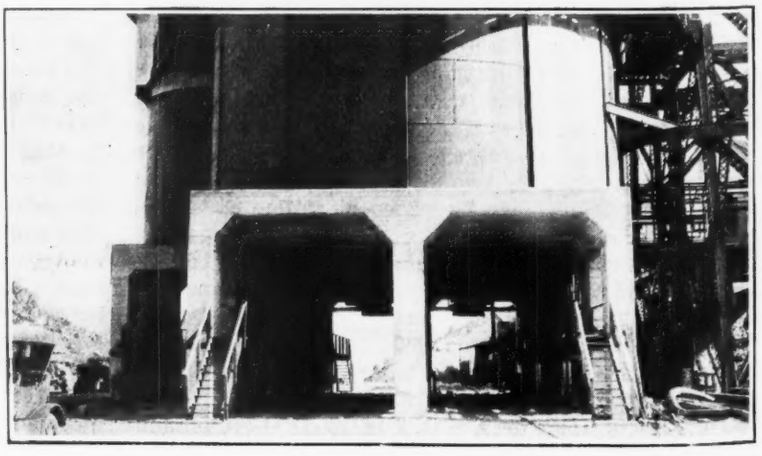
Below: Tail end of pan feeder in the crushing plant. It is built of manganese steel





Discharge end of pan feeder in the crushing plant

Below: Ore bins and loading tracks at the Porphyry shaft. The cars can be filled quickly



nals. Any signal given to call the cage is repeated at all landings, but not received by the hoist engineer; thus the cager will receive a signal if at or near a station when his control cable is out of order.

At all landings for the cage the approaches on both sides are protected by hinged gates set out far enough to allow them to swing in toward the shaft when opened. These gates are latched on the shaft side and can be opened only by the cager, thus preventing men at a landing from reaching either the shaft or the emergency signal switch.

The shaft has four compartments, and is concreted 1,403 ft. from collar to sump, being 12 ft. 4 in. by 16 ft. 8 in. inside. The two skips and cage have Douglas fir guides 5¼ in. by 9 in., which are bolted at regular intervals to malleable-iron bolt pockets set in the concrete walls of the shaft. The fourth compartment has the cage counterweight, pipes, conduit, and ladders. The counterweight has tee-section steel guides with its shaft completely screened in. On one side of the counterweight are steel ladders with landings every 17 ft. 7½ in., the landings being checkered steel plates supported on steel beams. On the other side of this compartment, with a narrow passage beside the counterweight shaft, are the pipes, a 10-in. 100-lb. air line, a 3-in. 1,000-lb. air line for air locomotives, a 3-in. drinking-water line to the mine, and a 6-in. discharge line for the mine pumps. All pipes in the shaft except the drinking-water line have welded joints; also the 1,000-lb. air line on the twelfth level, which is a 6-in. pipe.

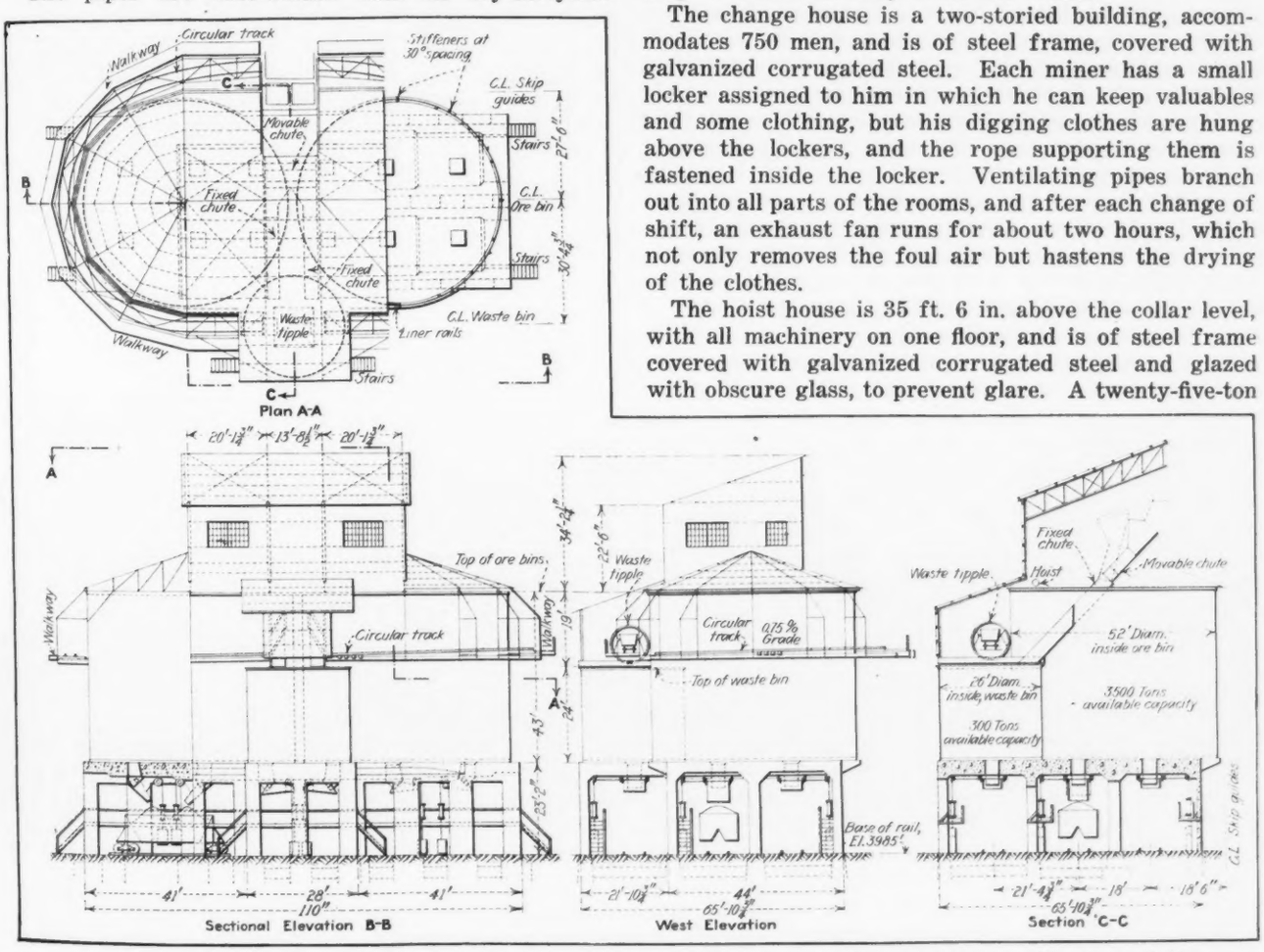
The pipes are butt-welded with an oxy-acetylene torch, a "V" joint having been made by turning the pipe in a lathe. Then a mild-steel plate is wrapped around the joint and welded into place as it is heated and hammered to a snug fit. The two edges of the plate which meet are welded together last. The pipes in the shaft had two lengths welded together in the shop, were lowered, and the joints of each pair welded at the collar of the shaft. When the string of pipe became too heavy to handle, it was lowered into place and another string welded at the collar, the two strings being welded together in place in the shaft. So far there has not been a leaky joint, which is an expensive repair job in a shaft.

Electric cable was taken to the 600 level on reels which were placed on shafts in bearings and the cables raised to the collar. In a similar manner cables were raised from the twelfth level to the sixth.

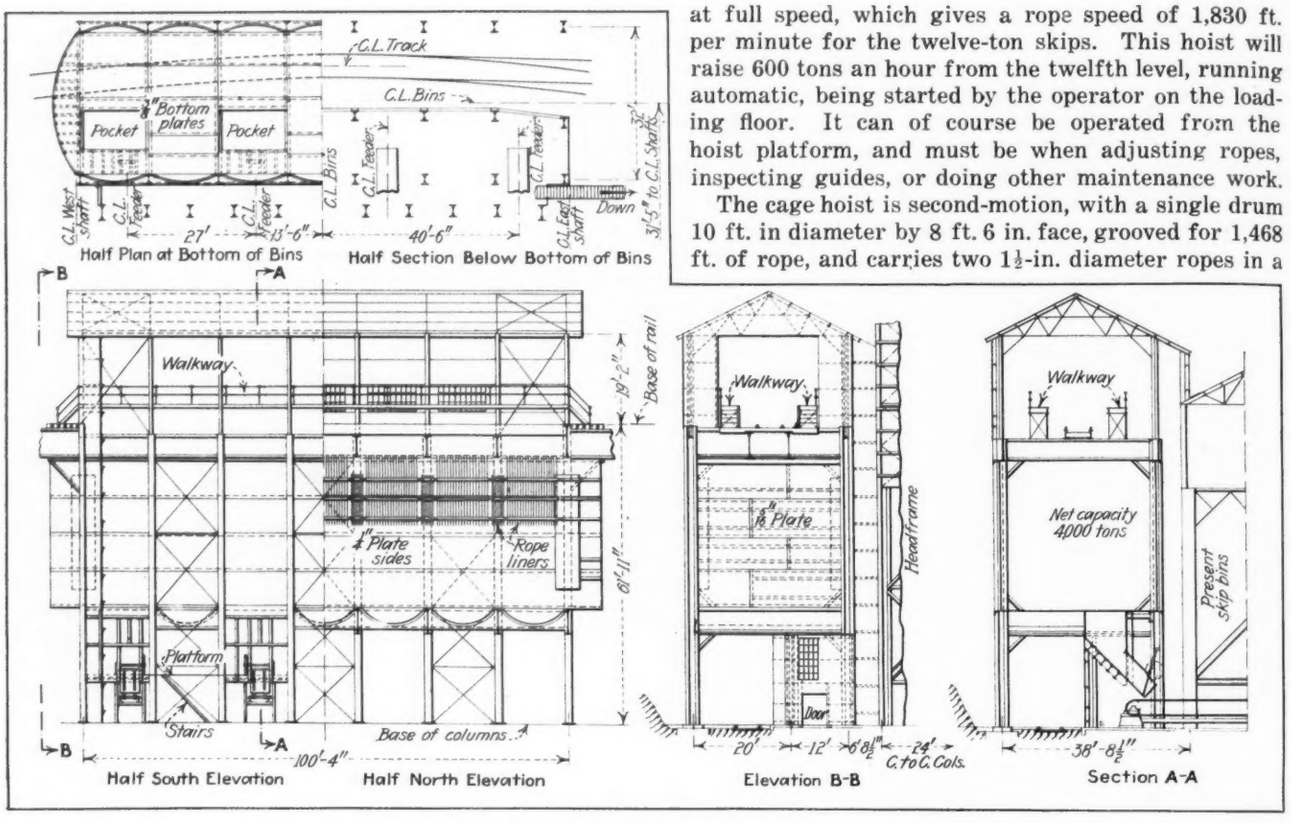
The headframe is 155 ft. from collar to the center of the skip sheaves, which are 13 ft. in diameter. The cage and counterweight sheaves are 10 ft. in diameter, all bicycle type, running in heavy split boxes, babbitted. The skip ropes are 1⅞ in. in diameter, lang lay, special seale construction, and the cage ropes 1¼ in. in diameter, lang lay, seale construction, all 6 by 19. Stairs run from the collar level to the top platform, of usual slope, with frequent landings, making the ascent easy and safe. Covered runways from the change house go to each side of a cage landing 22 ft. above the collar level. This permits men to enter the cage on one side as others leave by the opposite side, and at all times keeps the miners away from the collar.

The change house is a two-storied building, accommodates 750 men, and is of steel frame, covered with galvanized corrugated steel. Each miner has a small locker assigned to him in which he can keep valuables and some clothing, but his digging clothes are hung above the lockers, and the rope supporting them is fastened inside the locker. Ventilating pipes branch out into all parts of the rooms, and after each change of shift, an exhaust fan runs for about two hours, which not only removes the foul air but hastens the drying of the clothes.

The hoist house is 35 ft. 6 in. above the collar level, with all machinery on one floor, and is of steel frame covered with galvanized corrugated steel and glazed with obscure glass, to prevent glare. A twenty-five-ton



Ore bins at the Porphyry shaft. The bins are circular and can be quickly emptied into railroad gondolas



The new bin at the main shaft of the Inspiration company

This bin was built in the rear of the old ones and feeds the crushing plant.

electric crane serves the building, which has a standard-gage railroad track entering it, below the travel of the crane. At one end of the building is a 3,000-cu.ft. compressor for 100 lb. air. At the other end is the cage hoist, and between it and the compressor are the ore hoist, two motor generator sets, an oil accumulator, and a switchboard. The hoists are placed beside each other, instead of in the usual arrangement of one hoist in front of the other, and under its ropes. This arrangement saves floor space, permits the crane to serve either hoist while the other is running, and both hoists are thus close to the building wall, so the holes for ropes are not high, thus permitting a low roof, and still allowing the crane to travel over the ropes. The ore hoist is centered with the shaft and the cage hoist makes an angle of 11 deg. with it. Two motor-driven exciters, one a spare, serve the hoists and compressor motors.

All starting and control panels are arranged in one long switchboard near the center of the building and to one side. Each hoist has its own motor-generator set with flywheel and slip regulator, but there is a common oil accumulator for brake control for both hoists. In an emergency, the man hoist may be run from the motor generator of the ore hoist, thus insuring the operation of the cage should the generator set for that hoist be down for any reason.

The ore hoist is first-motion, with double drums 12 ft. in diameter by 8 ft. face, one drum loose, both grooved for one layer of 1¾-in. diameter rope 1,700 ft. long. The motor[1] is direct-current, 2,150 hp., and is rigidly connected to the drum shaft. It makes 51 r.p.m. at full speed, which gives a rope speed of 1,830 ft. per minute for the twelve-ton skips. This hoist will raise 600 tons an hour from the twelfth level, running automatic, being started by the operator on the loading floor. It can of course be operated from the hoist platform, and must be when adjusting ropes, inspecting guides, or doing other maintenance work.

The cage hoist is second-motion, with a single drum 10 ft. in diameter by 8 ft. 6 in. face, grooved for 1,468 ft. of rope, and carries two 1½-in. diameter ropes in a single layer, the overwound rope operating the cage and the other a counterweight. The motor is direct-current, 600 hp., and connected by a flexible coupling to the pinion shaft of the hoist. This hoist has two operating speeds, 800 ft. per minute when handling men and 1,500 ft. per minute when handling waste or other material. The lower speed is to comply with the state law and to insure safety when men are riding. The higher speed is to enable the cage to handle more waste than it could at the lower speed. There is a double-throw switch that in one position prevents the cage moving faster than 800 ft. per minute and in the other position allows any speed up to 1,500 ft. per minute. The cab for the hoist operator has one side against the end of the hoist-house building, thus allowing large doors to be opened to the outside air for ventilation. The windows in the other three sides are fixed, these being inside the hoist house.

The ore from the Porphyry bins is dumped into a new bin at the crushing plant. A standard-gage railroad between the bins is 7,000 ft. long, and has a grade of 2.7 per cent in favor of the load, with numerous curves and two steel trestles 76 ft. and 62 ft. high, respectively. The ore cars, similar to those heretofore in use hauling ore from the crushing plant to the concentrator, are sixty-ton Ingoldsby bottom-dump cars with air brakes and steel wheels. The locomotives are steam, 100 tons, three drivers, with side tanks, oil burning and no tender. There are five of this type to handle the company's traffic between mine, mill, and smelter.

The new bin at the crushing plant has an available capacity of 4,000 tons and is long enough for four cars to dump at a time. Used 1¾-in. diameter steel

[1]The electrical features of the Porphyry hoists will be described in an early issue.—Editor.

hoisting ropes were cut into lengths equal to the height of the bin and hung inside as liners to protect the sides from the abrasion of ore when unloaded and when sliding down the sides to the gates.

The crushing plant had four pan feeders that reached under the skip bins, two gates serving each feeder. It was desired to have these feeders pass under the two gates and to reach the gate of the new railroad bin, which is alongside the skip bin. When drawing ore from the skip bin two gates are used, but in drawing from the railroad bin only one gate is used; hence the new feeder must run twice as fast as the old when drawing ore from the new bin. The old feeders were not stout enough to stand lengthening and doubling the speed, and so new feeders were designed. These are of manganese steel with a flush top, running on rollers with fixed bearings, and sprockets at both ends. In the crushing plant there are four feeders, 48 in. wide and 42 ft. 6 in. long, which have speeds of 10 and 20 ft. per minute. They are started and stopped by push-button control at the discharge end of the feeder, where a man is stationed to pick out wood.

The two feeders underground are similar to those in the crushing plant except that they are 7 ft. 6 in. long and have a speed of 10 ft. per minute only.

A new power line of two circuits, with 300,000 c.m. copper for 6,600 volt, 25 cycle, was run from the main shaft's substation to the Porphyry hoist house, and is 6,400 ft. long.

All gutters and downspouts are of copper, and the galvanized corrugated siding and roofs are of copper-bearing steel, as are the new five-ton mine cars and sixty-ton surface cars.

Design, construction, and equipment were by the following:

The designs were made by the engineering force of the Inspiration company, or directly under its supervision in the drafting office with the aid of manufacturers' representatives.

The structural steel for all buildings, bins, trestles, and other construction was fabricated and erected by the Kansas City Structural Steel Co., which sent two of its engineers to this company, where the structures were designed. The steel weighed 1,661 tons, 413 alone going into the headframe.

Both hoists were built by Nordberg Manufacturing Co. and the General Electric Co., one furnishing the mechanical equipment and the latter the electrical.

The compressor was made by Ingersoll-Rand Co. and the synchronous motor driving it by the General Electric Co.

The skip loaders were designed by the company's engineers and fabricated by the El Paso Foundry & Machine Co.

The spill skips, twelve-ton skips, spring chairs, cage, and counterweight were designed by the company's engineers and fabricated in the company's shops.

The sheaves were made by Wellman-Seaver-Morgan Co.; also the single-car dumper over the waste bin.

The six-car dumper at the twelfth level was designed and made by the Car Dumper & Equipment Co.

The manganese-steel feeders were designed by the company's engineers with the assistance of an engineer from the American Manganese Steel Co., who also fabricated the feeders.

The hoisting ropes were made by John A. Roebling's Sons Co.

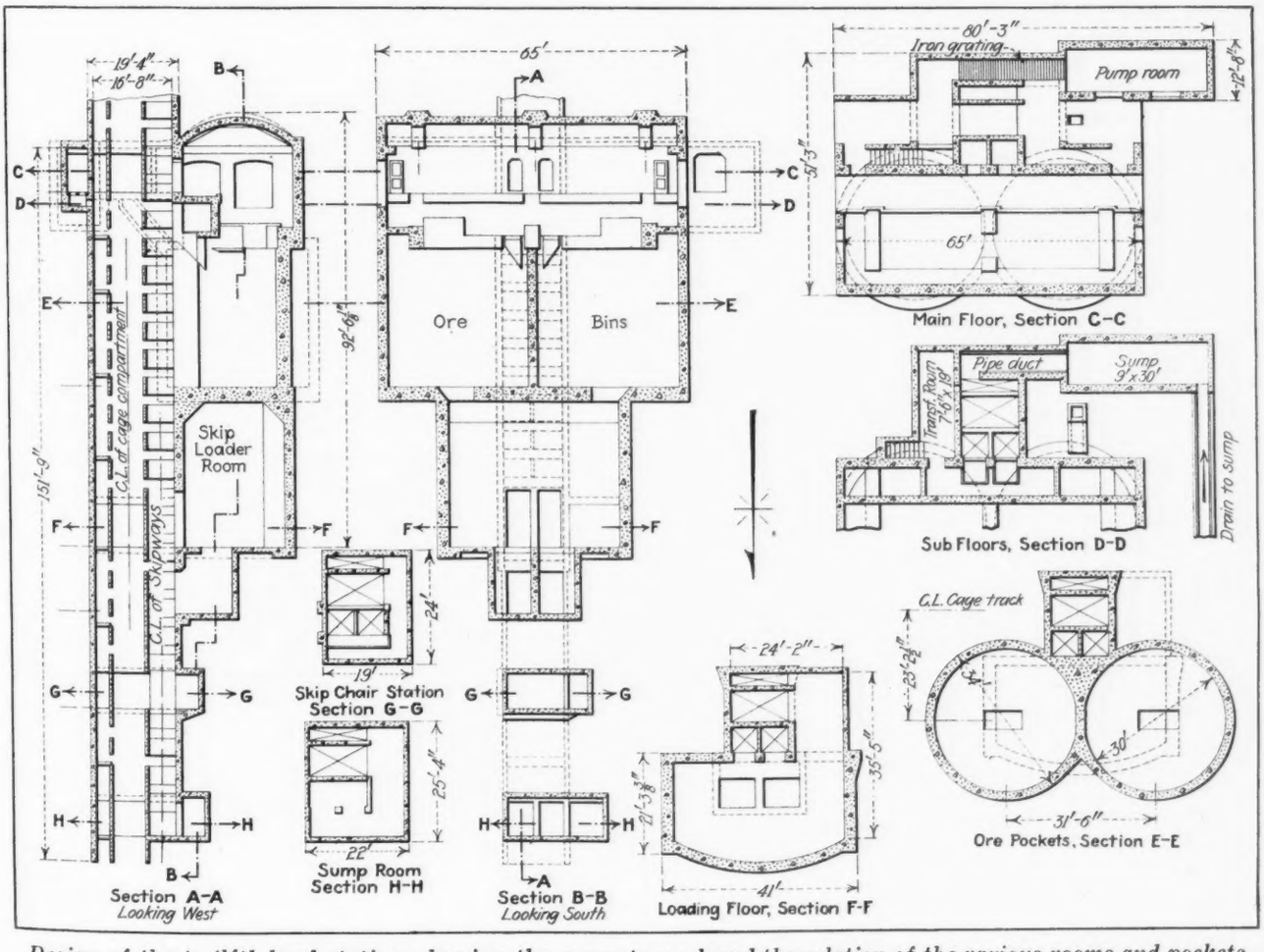
The air-operated gates under the Porphyry bins were designed by the company's engineers and fabricated by the M. H. Treadwell Co., Inc.

The hoist house crane was made by Pawling & Harnischfeger Co.

The air locomotives were made by Porter Locomotive Co.

The five-ton mine cars and the sixty-ton ore cars were made by Koppel Industrial Car & Equipment Co.

This article is intended to describe the operation of the equipment rather than the details, which are well shown by the accompanying illustrations.



Design of the twelfth-level station, showing the concrete work and the relation of the various rooms and pockets

The Geologic Distribution of Gold

By T. A. Rickard

MY RECENT ARTICLE on the discovery of gold in Australia prompts me to discuss Murchison's prediction, to which Hargraves makes respectful reference in his little book, published in 1855. It will be remembered that Sir Roderick Murchison, one of the founders of modern geology, in the course of his elaboration of the Silurian system of rocks in Europe, made a study of the Ural Mountains, including the gold fields of that region, which in the first half of the last century were of considerable importance. On his return from Russia, he published the results of his investigations in a series of papers that were read before scientific societies during 1841 and the succeeding years. In 1844, in a paper[1] issued by the Royal Geographical Society, he drew attention to the similarity existing between the gold-bearing rocks of the Urals and certain specimens that his friend Count Strzelecki had brought to him from Australia.

The Ural rocks were highly altered crystalline schists; those from Australia were siliceous slates. Both were of Lower Silurian age, as was proved by fossils and correlation. Murchison remarked upon these resemblances, and noted that the Australian specimens exhibited quartz, although as yet no gold had been found. Furthermore, he drew attention to the similar trend of the Australian mountains and his beloved Urals. He really knew nothing about the geologic structure of Australia[2]; nevertheless the analogies that he had detected led him to declare his opinion that gold must exist in Australia. Some specimens of Australian gold ore were sent to him in 1846, whereupon, at a meeting of the Royal Geological Society of Cornwall, he urged the tin miners to emigrate to New South Wales, and there obtain gold by aid of the methods they used for washing tinstone from the gravel in Cornwall.[3] Meanwhile he had issued a statement, based upon his studies in Russia, that gold would be found exclusively in the Paleozoic rocks, and chiefly in the Lower Silurian. Thereupon, when, in 1851, the discovery of gold by Hargraves was made known, and shortly afterward it was ascertained that the gold of Victoria and New South Wales occurred on and in beds of slate and sandstone belonging to his favorite geologic period, the Silurian, the event was heralded as the confirmation of a scientific dictum, and Murchison was congratulated on his successful prediction. He congratulated himself, In the third edition of "Siluria," published in 1859, the "inductive reasoning" that led to his hypothesis was repeated, and he said: "My chief article of belief has now proved to be true—that is, that the rocks which are most auriferous are of Silurian age." The rash generalization is restated: "The Paleozoic accumulations . . . particularly the Lower Silician . . . are the chief sources whence gold has been or is derived."

Australia indeed seemed to corroborate him. It was not until 1864, when the results of the work of the Geological Survey of California, under J. D. Whitney, were published, that the Silurian formation lost a preeminence to which it never was entitled. The principal gold-bearing rocks of California were found to belong to the Jurassic. Murchison's fallacy was confounded. It was a fallacy that the later development of gold-mining districts in other parts of the world has shattered into as many fragments as there are subdivisions of geologic time. The following summary is eloquent:

Period	Rock	District	Region
Quaternary	Andesite	Monte Cristo	Washington
Tertiary	Dacite	Hauraki	New Zealand
Cretaceous	Sandstone	Verespatak	Transylvania
Jurassic	Schist	Amador	California
Triassic	Limestone	Raibl	Carinthia
Permian	Conglomerate	Stupna	Bohemia
Carboniferous	Shale	Gympie	Queensland
Devonian	Limestone	Ouray	Colorado
Upper Silurian	Slate	Hill End	New South Wales
Lower Silurian	Slate and sandstone	Bendigo	Victoria
Cambrian	Conglomerate	Witwatersrand	Transvaal
Algonkian	Schist	Black Hills	South Dakota
Huronian	Calc-Schist	Minas Geraes	Brazil
Archean	Granite and Schist	Kolar	India

To this I might add that the Mount Morgan mine is chiefly in grauwacke of Carboniferous age; the lodes of Porcupine are in Pre-Cambrian schist; the mines of Bulawayo, in Rhodesia, are in Archean schist and granite; and the ancient gold field of Wicklow, in Ireland, is in the Lower Silurian, to which also belong the gold veins of Wales, although some of them are in the Upper Cambrian. The phonolite of Cripple Creek is of Tertiary age. This recital of localities and formations suffices to commit any generalization into the discard. Gold has been found in deposits so recent as the sinter derived from existing thermal springs in Nevada, and so ancient as the conglomerate formed from Pre-Cambrian rocks in South Dakota. In Colorado, a region with which I am particularly familiar, gold has been mined profitably in formations ranging in age from the Miocene to the Archean, and in rocks of such variety as to flout a petographic no less than a stratigraphic generalization. However, an alternative statement of wide comprehensiveness is permitted by geologic observation.

Posepny came close to it when he said that "genuine ore-veins entirely unconnected with eruptive rocks are not easily to be found—especially not in cases of important and well-studied districts.'" That is true. Economic geologists will agree that the gold in the sedimentary rocks as now mined is usually, if not always, of extraneous origin; that the ore deposit represents an impregnation by mineral solution, and was not a constituent portion of the marine sediment when it was laid down. As metamorphism usually involves changes due to movements that have released igneous intrusions or is due directly to the heat and thermal activity caused by them, it is reasonable to connect the making of metamorphic rocks with vulcanism in some form. Of the direct effects of igneous intrusions in bringing the metals within the zone of circulating waters we have ample proof. Thus the stratigraphic position of a rock becomes of an importance quite secondary to its structure, or even its relative solubility. The conglomerate beds of the Rand may be Devonian or Cam-

[1] "Russia in Europe and the Ural Mountains." *Transactions* Royal Geological Society. Vol. XIV, p. 437.

[2] "Life of Sir Roderick Murchison," by Archibald Geikie. Vol. II, p. 134.

[3] *Transactions* Royal Geological Society of Cornwall, 1846, p. 324.

[4] Raymond's translation of Posepny's "Genesis of Ore Deposits." *Transactions* A.I.M.E., 1901, p. 79.

brian, but the presence of gold in them is probably related to the invasion of the sedimentary series by the dikes, which appear to have enriched portions of the banket series. The country rock of the Homestake mine may be Pre-Cambrian, but the richness of the orebodies appears to be related to dikes that pass not only through the ore-bearing schist but also through the overlying rocks of an age as late as the Cretaceous.

In Colorado, where I studied this matter twenty-five years ago, I came to the conclusion, with which my friend Emmons concurred in private conversation, that the origin of the gold and silver lodes was connected in every case, directly or indirectly, with dikes and sills of intrusive rock, the age of which wherever it could be determined—and exceptions were rare—was of Post-Cretaceous—that is, Early Tertiary.

It is only fair to Murchison's memory to give him credit for appreciating the rôle played by igneous rocks in affecting the distribution of gold; in the second edition of "Siluria" he says: "The general axiom which I would now further lay down is, that as no aqueous deposit of Primary, Secondary, or older Tertiary date has been ever found to contain gold in its unaltered original matrix, it seems to follow that certain rocks of igneous origin must have been the gold-producers, impregnating with metal the contiguous sedimentary matter which they metamorphosed."

"High-Grading" Mica Hurts Industry in India

Special Indian Correspondence

The Indian Mica Mining Association has of late been greatly concerned regarding the position of the industry. The importance of the mica mines of India arises from the fact that India supplies about 70 per cent of the world's requirements of sheet mica. The principal trouble is the opportunity given under present conditions for stealing. It is reported that about 50 per cent of the mica mined is stolen; and that proper legislation might correct this in a measure. The chief mica-mining areas are the Nellore district, in the Madras Presidency, and the Kodarma mines, in Bihar and Orissa.

Some time ago, Mr. Hobson, of the Geological Survey Department, was deputed by the government to inspect the mines and suggest improvements. Mr. Hobson found the Nellore mines being worked by the most primitive methods, and recommended the employment of the expert staff for inspection of mica mining; but the government of Madras did not look with favor upon these recommendations, and thus the working of the mines was left in the same unsatisfactory condition as before. In the Kodarma mines, Mr. Hobson found similar conditions, and pointed out the necessity of careful mine mapping. He was also of the opinion that the system of contract working is undesirable and encourages mining on an unsound and unscientific basis, and that its discontinuance would prevent waste and assist any plan suggested to reduce the stealing of mica. This thievery has assumed unusual proportions. The principal reason for the theft of mica is that it is easy for a coolie or a sirdar or a durwan to dispose of mica, because unless he is caught red-handed identification is extremely difficult. It is practically impossible to identify mica, and therefore, under present regulations, which require that a mine operator must identify his own mica before a charge can be brought, a thief is safe in carrying on illicit trade.

There are three classes of mica thieves: (a) The coolie and sirdar who are employed in the mines and who by collusion manage to appropriate a certain part of the mine output, and sell it at a very low price to any one willing to buy. This mica may be worth in the London, American, and Continental markets anything up to 75s. per pound. (b) The class of people who possess a small plot of land which they profess to mine, but who in actual practice buy from the coolie or sirdar referred to above, and sell the mica thus stolen as their own output. (c) The middleman or modi or small shopkeeper who buys mica indiscriminately and sells it to the best bidder.

There are also a number of persons who make a comfortable income from writing receipts for mica stolen, so as to safeguard the thief against the present law.

The principal defect in the law is that the dealers in mica are not subject to the same disabilities as the producers themselves, as there is no strict licensing system regarding the former.

The first step to remedy this state of things is the strict licensing of dealers. The Mica Mining Association is therefore urging legislation to that effect. It also asks for the appointment of a special officer who is by profession a mineral miner and geologist, who shall possess authority to inspect mines, recommend applicants for licenses, check stock, books, receipts, and other records of dealers and miners, and also to search places in which he suspects mica may be kept or stored.

Leasers Have Nose for Ore

By A. J. Dunn

Leave it to leasers to find ore when all others fail. Many years ago, when the old Standard mine, in the Cœur d'Alene district, Idaho, was owned by Finch & Campbell, a great cave occurred above the Campbell tunnel, which completely closed a wonderfully rich stope. All efforts to reopen it and to reach the orebody from various approaches failed. The mine finally passed to the ownership of the Federal Mining & Smelting Co., which worked it out and abandoned it many years ago. As years passed leasers began nosing about the old workings, secured leasing rights from the Federal, with the result that for several years much ore has been discovered and profitably shipped. Some of these leasers had worked in the Standard under the Finch & Campbell regime and knew about the "lost stope" or the "million dollar stope," as it was called, and tried to find it, but without success. One of these was John Malmquist. More persistent than others, he, with two associates in a lease, continued his efforts to find the "lost stope." Recently Malmquist struck a rich shoot of lead-silver ore where the famous stope should be.

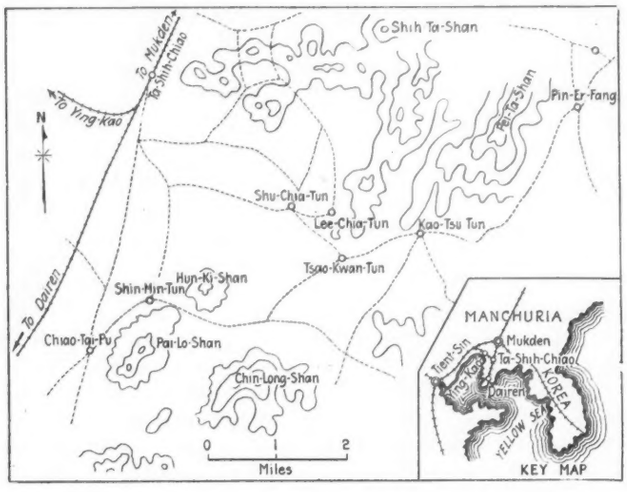
Another example of leasers finding rich orebodies in abandoned mines is the Snowstorm, also in the Cœur d'Alenes. After being abandoned as worked out for years, William Zikler, a miner who worked in the Snowstorm when it was an important producer of copper and silver, obtained a lease on the entire property. After many weeks of hard work cleaning up caves and retimbering No. 3 tunnel, he reached the old workings. Investigation disclosed a shoot of rich silver-copper ore 18 in. thick and which has been located for twenty-two "floors" above.

An Enormous Magnesite Deposit in Manchuria

By Hironao Nishihara
Mining Geologist, Darien, Manchuria

AN ENORMOUS DEPOSIT of magnesite is situated in Manchuria, 3 miles southeast of Tashihchiao, the junction for the branch line to Yingkao, and at about a midpoint between Dairen and Mukden. Mining was started about ten years ago, and is now under the control of the South Manchuria Mining Co.

The country has undergone much denudation, and



Map showing the location of the Manchurian magnesite deposit

hilltops are well rounded and smooth with gentle slopes. Vegetation is sparse, and the hills are exposed, bare, rock surface, where bedding structure (when looked at from a high elevation) can be traced for several miles without interruption. It is a great country for a geologist. The foothills are buried by red clay derived from the weathering of ferruginous dolomite, which is widespread; and are dissected with sharply cut small gulleys resembling artificial trenches. Dry climate and sudden precipitation are the factors responsible for the development of such foothill topography, peculiar to southern Manchuria.

A series of metamorphosed sedimentary rocks consisting mainly of dolomite of varied texture and composition, together with slate, sandstone, magnesite, and schist, has a general northeast strike and dips south at various angles between 50 and 70 deg. at and around Pai-Lo-Shan, decreasing toward the east to only 7 deg. near Kao-Tsu-Tung.

Magnesite Exposed for a Thickness of 780 Feet

At Pai-Lo-Shan the magnesite beds occur at three places, alternating with slate and dolomite. At the southern end of Pai-Lo-Shan a mass of coarsely crystalline magnesite is exposed to a thickness of 780 ft. and then dips under the soil. The age of the rocks has been placed as Cambrian by the geological survey of the South Manchuria Railway Co.

The dynamic metamorphism of the rocks may be ascribed to a Post-Cambrian acidic intrusive rock, which is exposed about 10 miles northeast of the deposit. The fact that the contact between schistose dolomite, slate, and the unusually coarse crystalline magnesite bed shows no schistosity, but is sharp and conformable, is rather difficult to explain. Crystallization of the magnesite as well as dolomite might have taken place during or after the process of dynamic metamorphism. No intrusive dikes or any other igneous rocks can be seen in the magnesite deposits or dolomite.

The magnesite is creamy white or slightly tinted with pink; or, in some places, light bluish gray, and the crystals are as much as 1½ in. long. It is opaque and has a vitreous luster, like barite. Its hardness is 4.5 and its specific gravity 2.97. An analysis of a sample piece of white coarse crystalline magnesite gave the following composition:

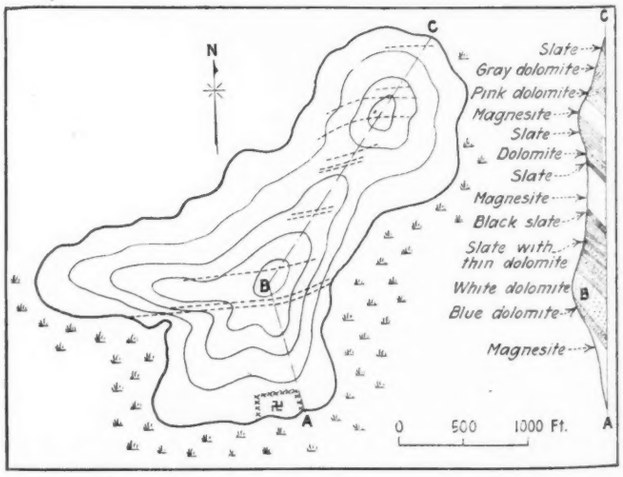
Constituent	Per Cent
$MgCO_3$	96.05
$CaCO_3$	1.00
Fe_2O_3	1.29
SiO_2, Al_2O_3	1.45
Total	99.79

Another analysis made on average samples of light-gray coarse crystalline magnesite showed the following:

Constituent	Per Cent
$MgCO_3$	90.55
$CaCO_3$	0.09

In comparison with these analyses some of the magnesites from the noted producing countries may be mentioned. The average composition of Austrian magnesite is 88 per cent, with 8 per cent of alumina and ferric oxide. The Hungarian deposit is much richer, and contains between 92 and 95 per cent of magnesite and between 3 and 4 per cent of Fe_2O_3. The Silesian magnesite is high in silica, or 95 per cent magnesite and 3 to 5 per cent in SiO_2. Euboea Island, of Greece, is noted for its pure magnesite, which is composed of 95 per cent in $MgCO_3$ and 3 to 5 per cent in $CaCO_3$.

The dolomite referred to in this article has various colors—black, gray, white, brick red, or bluish gray—and various textures, from almost amorphous to coarse



Sketch map showing the geology of Pai-Lo-Shan

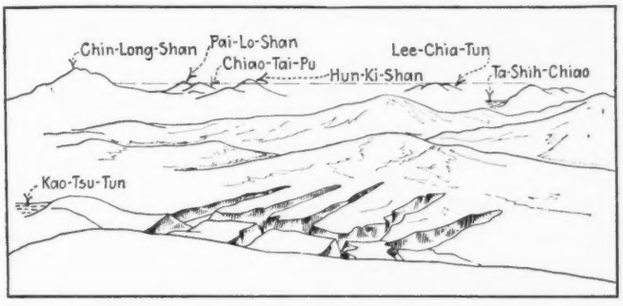
crystalline. Some of the fine-grained dolomite is schistose and can be split into sheets ¼ in. thick. Analyses of dolomite from various beds are given in

the accompanying table; it may be noted that they are all fairly close to the theoretical composition of dolomite:

Table Showing Characteristics of Various Dolomites

Location	Description	MgO, Per Cent	CaO, Per Cent	FeO, Per Cent
Pai-Lo-Shan.....	Pink, medium grained....	20.81	29.76	.....
Pai-Lo-Shan.....	Red, fine grained.....	20.26	30.15	.....
Pai-Lo-Shan.....	Gray, fine grained.....	19.26	24.69	.....
Pai-Lo-Shan.....	White, fine grained.....	17.08	26.40	.....
Chin-Shan-Kwai...	Pink, fine grained.....	20.02	30.62	1.67
Chin-Shan-Kwai...	Pink, coarse grained.....	20.55	30.12	1.73
Cniao-Tai-Pu.....	Pink, coarse grained.....	19.90	31.25	1.28
Pai-Lo-Shan.....	White, fine grained.....	13.98	32.80	1.76
Pai-Lo-Shan.....	White, fine grained.....	16.91	33.25	1.60
Pai-Lo-Shan.....	Gray, medium grained....	18.90	19.01	1.28

At Pai-Lo-Shan alone reserves of 1,400,000 tons are estimated, and, if these continuous beds for a distance of 5 miles eastward be taken into account, the enormous figure of at least 300,000,000 tons above the level



Sketch showing topography viewed from the top of Pei-Ta-Shan

of the ground may be assumed. I have seen no other similar magnesite deposits of this magnitude and purity, and am convinced that this is one of the most high-grade and also one of the most extensive deposits in the world.

Sundry Theories of Genesis

As to the genesis of the deposit, many different theories have been advanced, without coming, however, to any definite conclusions. The various modes of occurrence so far known to me through the literature of the subject are:

1. Irregular veinlets in serpentine or allied basic rocks as secondary alteration product.

2. Deposits interbedded with rock salt and gypsum and supposed to be precipitated directly from salt water in a form of carbonate of magnesium.

3. Deposits interstratified with shale or limestone and supposed to be a product of replacement of limestone by magnesium-bearing waters.

The Californian and Grecian deposits belong to the first type, as they occur in veinlets in serpentine rock and the orebody is pockety or irregular. A big deposit in Stevens County, in Washington, seems to resemble in many respects the Manchurian deposit herein described. There "the magnesite deposit occurs in lenticular bodies in dolomite, the masses being of large dimensions, hundreds of feet in thickness and a thousand or more feet in length. It is evidently of sedimentary origin, although the recrystallization of the pure magnesium carbonate may have been secondary, possibly influenced by intrusion of basic magnesian rocks."[1] The same deposit is described in the *Engineering and Mining Journal* of Sept. 29, 1917, page 549, as coarsely crystalline and occurring in great ledges for a distance of a quarter of a mile, and free from intrusions or inclusions of foreign rocks. The magnesite is said to be in contact with dolomite or slate.

Manner of Occurrence

The Manchurian magnesite occurs in alternate beds with dolomite and slate and does not assume a lenticular shape or irregularity of any kind. The magnesite beds are sharply in contact with dolomite beds and are distinct in color, texture, and chemical composition from the dolomites. Is it possible to assume that a sharply defined and coarsely crystalline deposit like this was formed by the replacement of limestone or dolomite by magnesium-bearing waters? "The fact that finely divided calcium carbonate, will precipitate magnesium carbonate from its solution in sea water was established by the experiments of Scheerer and Hoppe-Seyler."[2] "According to F. Hoppe-Seyler the sea water mixed with an excess of calcium carbonate and saturated with carbon dioxide, after standing four months in a closed flask, failed to form dolomite. But when magnesium salt or sea water were heated with calcium carbonate in sealed tubes, both dolomite and magnesite were formed. Carbonate of lime, heated to over 100 deg. with a solution of magnesium bicarbonate, gave this result."[3] These experiments seem to show that a considerable temperature is necessary for the formation of magnesite. "Pfaff experimentally shows that when a current of carbon dioxide is passed for a long time through a warm solution of the sulphates and chlorides of magnesium and calcium, upon slow evaporation at a temperature of 20 to 25 deg. it yields a residue, which contains a double carbonate insoluble in weak hydrochloric acid. That is, under these conditions, which might be approximately paralleled in the connection of sea water, dolomite may be formed." If the composition of sea water is variable during geological time, can it be possible, under conditions similar to those in the above quoted experiments, for dolomite or magnesite to have been precipitated?

The magnesite deposit of the Washington type was regarded in the United States of America as hitherto unknown; and the discovery of a similar deposit of great magnitude in Manchuria may be sufficient to stimulate further search for pure magnesite in metamorphosed sedimentary rocks.

[1]Spedd, S.: "The Building and Ornamental Stones of Washington," Washington Geological Survey, Annual Report for 1902, Vol. 2, pp. 87-103, 1903.

[2]"Data of Geochemistry," 1920, p. 560.

[3]"Data of Geochemistry," 1920, p. 563.

Hoboken Smelts 700 Tons of Tin Ore a Year

The tin smelter near Antwerp, Belgium, owned by the Société Générale Metallurgique de Hoboken, treats now on the average about 700 tons of cassiterite per year, according to F. W. Allport, Commercial Attaché at Brussels. This ore comes from the Congo and has a metal content of about 70 per cent. Treatment is by special process which the Belgians claim gives a very fine-quality product. This smelter was opened in 1923 and will not be extended for the present. There is, however, a project on foot for construction of a refinery. The company uses in tin production not only cassiterite mined from its own concessions in the Congo but also small quantities mined by other companies.

Marketing Crushed Stone

A Product in Which Production, Orders and Shipments Have To Be Carefully Balanced

By H. B. Allen
District Sales Manager, The General Crushed Stone Co., Easton, Pa.

MENTION of crushed stone hardly impresses the average person with the importance of the industry engaged in its production, although its rapid and remarkable development during the last five to seven years, involving investments often as high as $2,000,000 in a single plant, bespeaks its growth and size among other established industries.

Stone quarried from the limestone deposits provides flux used in large quantities by the country's great iron and steel foundries in the manufacture of their product. When crushed fine it is used extensively for agricultural purposes and when burned into lime forms a base for materials which find a place in practically an unlimited numbers of industries. The harder and tougher limestone, dolomite, sandstone, and igneous formations, when crushed and screened to the proper size, is used in every conceivable character of construction, besides having many special uses, but the full realization as to its value and contribution to the growth and economic welfare of the nation is manifested when it becomes apparent that crushed stone is a vital necessity to the building, maintenance, and safeguarding of our great system of railroads and for the construction and maintenance of the network of highways now being built by practically every state in the Union.

Transportation Charges Often Equal Value of Product at the Quarry

Crushed stone is largely transported by rail, so it is plain that its value is at the point of use and not at the point of origin. Generally speaking, the present freight charges for the average haul throughout the country equal the value of the stone, so the tremendous influence of transportation is evident, the scope of territory of a crushed-stone plant in a normal market reaching its limitations when the freight rate becomes greater than the value of the stone. Federal rate-making authorities during the war made heavy increases in the freight rates on crushed stone, proportionately greater than that on many other commodities, presumably in the belief that this article could better stand, and with probably less hardship, a larger share of the burden of the greatly increased operating expenses of the railroads. High freight rates and temporary lack of transportation facilities are in a large measure responsible for the gradual but steady development of local crushing operations and have compelled road contractors to crush their own stone. Where possible a suitable deposit continguous to the work is developed when the tonnage involved warrants the investment necessary to set up a crushing and screening plant.

Many road contractors have been misled as to the economy in establishing their own quarries and crushing plants—they soon find that they are engaged in a hazardous business, and often, after the plant is installed, changes are necessary, breakdowns frequent, and repair parts are expensive to replace and sometimes difficult to get. Not infrequently the operation is abandoned and the supply of stone obtained from a commercial plant.

Local crushing is often precluded in present road contracts by reason of the limited time specified in which the work must be completed. A substantial plant investment is justified only on the work of large paving units and other expensive road building. Moreover, it is not often that the contractor is willing or financially able to add to an already heavy investment the expenditure needed to install expensive stone-crushing machinery to produce stone in sufficient quantities and insuring uninterrupted deliveries. Although under normal conditions the effect of local crushing naturally would be to curtail the sales territory open to commercial plants, dame Fortune has been kind to the crushed-stone industry on account of the impetus to road construction that has developed during the last six or seven years. Ambitious, aggressive, and comprehensively planned road-building programs have been projected throughout the country, and regardless of high freight rates and local crushing, the permanent or so-called commercial crushed-stone plants with heavy investments will be taxed to their capacity to supply the amount of stone necessary to build the vast mileage of highways now or soon to be under construction. This indicates an encouraging future for crushed-stone producers for many years.

Prices of coal, dynamite, machinery replacements, and labor are the principal factors in the cost of producing crushed stone, and inasmuch as producers are not confronted with rapid and sharp increases in prices for labor and materials, as during and immediately after the war, the selling price, under present practice, established by the producers at the beginning of the operating season, is usually maintained throughout the season, except in cases where a certain size of material may have accumulated to a point beyond storage facilities, or when it becomes evident that the market will not absorb more tonnage of this size. In that event a price that would move this material to a market other than the normal market for that particular plant is justifiable and may be made.

Hand labor to load stone into quarry cars for conveyance to the crusher has been difficult to obtain for many years, and has made it imperative at many plants to change completely from hand to steam-shovel loading. These changes, requiring the installation of shovels and large crushing units at heavy expense, have stabilized production costs and helped to bring about lower levels of selling prices, which bear favorable comparison over a period of years with other commodities largely dependent upon labor for their production.

Unlike many other industries, crushed-stone producers, except for the operations situated in the Pacific Coast and Southern States, are limited in the time for producing and marketing their product to a period of about eight months, owing to the curtailment of road building, railroad ballasting, and general construction work during winter. A few of the larger plants in the East, with adequate facilities for stockpiling the various sizes produced, when there seemed to be an unusually active winter market continue operations throughout the year, except where severe winter

weather prevents and during the period of making repairs usually necessary to a stone-crushing plant at the end of a busy season. At least a month, and generally two to three months, of the winter period are consumed in making repairs to the average stone-crushing plant. Most producers are content to lengthen the time of idleness until the winter weather is over and the spring demand is upon them.

Crushed stone sold in 1924 (average prices prevailing throughout the country) at 85c. to $1.25 per net ton of 2,000 lb. for limestone, and $1.30 to $1.75 for trap rock, granite, or equally hard stone. By reason of the narrow margin of profit per unit of material, much of the financial success of the crushed-stone producer depends on the steadiness at which the plant is operated over the active operating season and the balancing of sales and distribution proportionate to the daily output of the plant. In many operations from 5 to 7 per cent of waste or unmarketable material commercially known as screenings must be charged against the production cost.

The seasonable demand for all sizes produced reaches its peak during a period of about three months—a comparatively short operating season. A lack of balanced orders for the larger sizes, particularly in the early spring, which condition obtains until the weather permits the resumption of road building and railroad ballasting, retards plant production. It becomes necessary either to recrush the larger sizes which are produced and commercially known as railroad or road ballast or place them in storage, in either case adding materially to the cost and usually not being justified. Many operators, however, have to resort to recrushing or stocking at some time during the season.

Notwithstanding the usual precaution of limiting the acceptance of quotations in respect of a certain project to a reasonable time to avoid subsequent commitments absorbing the plant's output, the problem that confronts the sales manager of a crushed-stone organization in laying out plans for balanced production and distribution during certain periods is difficult to say the least. To accomplish this satisfactorily beyond a period of three to four weeks of a normally busy season to any degree of success is wellnigh impossible. Contractors often do not take shipments with the degree of regularity or in the quantities agreed when the order was accepted. Still more often the shipper is suddenly confronted with a request to hold up shipments for a protracted period of time, owing to a change in the plans on the work, machinery breakdowns, or for some other reason, or to suit his convenience. Occasionally after a cancellation of an order by an unscrupulous contractor it develops that the cancelled tonnage is being procured elsewhere at a more favorable price. The loss of this tonnage is seldom "picked up" without temporarily retarding output and consequent increase in cost. The natural effect on the production and distribution when there are frequent occurrences of this kind is an overlapping of shipments, resulting in peak load demands and generally interfering with carrying out obligations arranged for prior delivery. This situation stone shippers have been and in the future will be obliged to accept, but this condition is growing less aggravating from year to year by reason of the fact that the contracting fraternity has advanced to a high business standard. Consequently a better understanding as to the rights and obligations of contractor and shipper must necessarily obtain.

It is not to be understood that the crushed-stone producer is afforded the privilege of furnishing his product to the vast field of construction activity without competition. It can reasonably be said, however, that crushed stone so far has successfully survived all competition to substitute for its use materials such as blast-furnace slag and gravel (which are cheaply produced) in concrete construction and water-bound macadam and various types of bituminous concrete and treated roads. In a large measure the success of these types of roads depends on the manner in which the aggregate with which they are constructed withstands the tremendous impact or thud delivered to the road surface by heavy-laden solid-tired trucks. Crushed stone, owing to its toughness and higher resistance to wear, is obviously better suited to resist the consequent shattering effect of such traffic on the road metal, and its superiority is now generally recognized.

There has been a noticeable tendency toward lowering the standard of requirements both as to hardness and toughness of the coarse aggregate used in the construction of cement concrete roads. Blast-furnace slag and gravel, where readily accessible, have been extensively used. Where these commodities are particularly advantageously located to the work, there seems a reasonable amount of engineering authority to justify their use by reason of their lower cost, on the theory that materials used in concrete need not be better than necessary to perform their individual functions satisfactorily. On the other hand, there is an abundance of authority among highway engineers and contractors to support the conviction that concrete is as good as the material from which it is made. The strength of concrete must depend not only upon the strength of the mortar and the strength of the bond between all of the aggregates but upon the strength of the coarse aggregate itself. This question it is presumed will be determined scientifically and satisfactorily at some future time when results of exhaustive laboratory tests and studies that are being conducted for this purpose throughout the country are made known. In the last analysis, the aggregate that has proven satisfactory for the particular type of road for which it is intended and which is the cheapest will be used. The crushed-stone industry does not view the situation with any degree of alarm, for the virtue of crushed stone was established in the ancient "stone age" and crushed stone will always possess a rightful and prominent place in the growth of the United States.

Crushed stone is shipped in open-top equipment and sold on a basis of a net ton of 2,000 lb. f.o.b. seller's plant, subject to railroad company's rates and rules. Credits and collections have in the past been and probably always will be troublesome, substantial losses having been charged off the books of the operators each year in uncollected accounts, owing largely to the inability in the case of the average contractor to obtain information through the usual channels or a financial statement from him as a basis upon which to establish credit relations. The various state highway departments of late years have incorporated in their contract specifications a provision requiring the contractor to furnish a bond, the purpose of which is to insure payment for all materials and labor furnished or otherwise to provide means by which a lien can be placed on the work in the event that the contractor's credit becomes impaired. Quite general among the stone shippers is the practice of allowing a cash discount of from 5c. to

10c. per ton. The period of time allowed the buyer to pay his bills so that he can earn this cash discount varies among the shippers, but usually the monthly estimates of the contractor are so arranged that they will provide the necessary funds to pay his material bills. The cash discount arrangement and bond protecting payment of materials exacted by the highway departments have proved very helpful to the shippers of crushed stone.

Rigid Inspections Sometimes Made

Although included in the terms of sale is a clause to the effect that responsibility of the shippers ceases with the proper delivery to the carrier, the customary practice is to allow acceptance or rejection of the material on cars at destination. Shippers are often compelled to accept undue penalties by unnecessary rejections due to inexperienced inspectors insisting on strict adherence to the specifications which define that certain percentages of material should pass a series of screens between the maximum and minimum sizes. This attempted refinement is not necessary, nor is there any assurance, even in the modern crushed-stone plant, that a uniform standard of percentages of sizes can be obtained, as the character of stone, speed and pitch of screen, and the amount of material that goes over the screen are all factors tending to vary these percentages. Many engineers today, however, are preparing their specifications with a liberal tolerance in the percentages of the various sizes of graded stone used, from small to large sizes.

In road construction, until recent years the importance of employing high-grade engineers who are qualified and whose duties it should be to inspect all materials and see that the work is done in accordance with the specifications has not been given the consideration it deserves. There seems little justification for the employment of a high-grade adequately paid engineer to draft specifications and the employment of an underpaid inexperienced inspector charged with the important responsibility of passing on material and supervising the actual construction work. Through the co-ordination of the shippers with the assistance of the trade associations and the state highway departments in some sections of the country the adoption of uniform sizes of stone for the different types of road construction has been made possible. This has been very helpful, but more particularly helpful is the fact that through this co-ordination and co-operation there now exists a better understanding between the quarry operator and inspector as to the particular value of the material which is being furnished as well as a stronger inclination to judge the material as to its fitness by observation rather than by over-precise field or laboratory tests.

The screen sizes generally adopted by shippers in the Eastern states and accepted by the various state highway departments are 3, 2½, 1½, ⅝, and ¼ in., the latter known as dust jacket.

In the average commercial crushed-stone plant equipped with these screens to furnish railroad ballast, the production approximates: 35 per cent of stone passing a 3-in. screen and rejected over the 2½-in. screen and commercially known as railroad or road stone ballast; 25 per cent of 1½-in. stone used for miscellaneous concrete construction and more generally in constructing the wearing surface of bituminous roads, which material is produced through the 2½-in. screen and over the 1½-in. screen; 18 per cent of ¾-in. stone passing through the 1½-in. and over the ⅝-in. screen, used extensively in concrete building and other concrete construction and also in connection with the repairing and oiling of bituminous macadam roads; 15 per cent of ½-in. stone passing the ⅝-in. and over the ¼-in. screen, which is used principally in surface treating macadam and bituminous roads; and 7 per cent of screenings, passing through the ¼-in. screen, of which size, owing to a limited market, the greater proportion produced is waste.

Specifications Vary Widely

Specifications for railroad ballast vary somewhat with the different systems. The product of the plant between the maximum and minimum screens is satisfactory to some roads, though in the case of others the inclusion of the sizes between the 1½-in. and ¼-in. screen is not acceptable. In furnishing ballast stone for road construction, material produced through the 3-in. and over the 1½-in. screen is usually specified, and for cement concrete road construction the product between the 3-in. and ⅝-in. screen is required.

By reason of a fairly steady demand throughout the season for the ½-in. and ¾-in. sizes, which comprise about 33 per cent of the total plant production, contrasted to a somewhat irregular market for the balance of the production or ballast and 1½-in. sizes, especially during the early spring and late fall, a higher price of from 15c. to 20c. per ton for the ¾-in. and ½-in. sizes is maintained. This price differential hardly covers the actual cost of reducing 100 per cent of the production by recrushing to the latter sizes when necessary, nor does it cover the cost in the other alternative —namely to stockpile and rehandle the larger sizes, an expedient necessary in the event of unbalanced orders.

Crushed Stone Sold in the United States in 1922 and 1923 (a)

	Road Metal and Concrete		Railroad Ballast		Total		
						Value	
1922	Short Tons	Value	Short Tons	Value	Short Tons	Total	Average
Granite	3,614,250	4,973,646	482,660	$441,430	4,096,910	$5,415,076	$1.32
Basalt and related rocks (trap rock)	8,313,670	10,284,048	1,290,180	1,370,220	9,603,850	11,654,268	1.21
Limestone	27,906,450	28,966,511	4,879,850	4,258,368	32,786,300	33,224,879	1.01
Sandstone	1,442,280	1,937,472	505,500	405,049	1,947,780	2,342,521	1.20
Miscellaneous	1,149,850	1,421,081	179,050	72,352	1,328,900	1,493,433	1.12
	42,426,500	$47,582,758	7,337,240	$6,547,419	49,763,740	$54,130,177	.....
Average value per ton	.....	1.13	.....	0.89	.....	1.09	.....
Percentage of increase in 1922	15	5	14	3	15	5	.....
1923							
Granite	4,400,410	$5,690,464	608,870	$539,645	5,009,280	$6,230,109	1.24
Basalt and related rocks (trap rock)	8,550,600	10,793,201	1,679,080	1,680,427	10,247,680	12,473,628	1.22
Limestone	33,382,210	35,925,709	8,004,340	6,615,045	41,386,550	42,540,754	1.03
Sandstone	1,360,300	2,110,230	700,370	518,705	2,260,670	2,628,935	1.16
Miscellaneous	3,154,380	3,836,490	264,150	218,735	3,418,530	4,055,225	1.19
	51,047,900	$58,356,094	11,274,810	$9,572,557	62,322,710	$67,928,651	.....
Average value per ton	.....	$1.14	.....	$0.85	.....	$1.09	.....
Percentage of increase in 1923	20	23	54	46	25	25	.....

(a) U. S. Geological Survey.

Discussion

"Engineering and Mining Journal-Press" is not responsible for statements or opinions published under "Discussion." In many cases the views expressed are diametrically opposed to editorial policy and belief.

Debt Repudiation

THE EDITOR:

Sir—Your correspondent, Mr. Adams, criticizing your frank and timely editorial on the subject of cancellation of war debts, entitled "Losing a Friend," takes the ground that mining engineers are better able to understand the fallacies of your views because they regard repayment "practically." He says the debts are gold debts and are therefore closely connected with the stock and production of gold. This is certainly ludicrous from a financiering standpoint, as everyone knows that banking and all business is conducted primarily on credit, and the actual handling of gold bullion and gold coin is infinitesimal as compared with the volume of world transactions.

The United States as a government and as a people stand and always have stood for honor and integrity in international dealings, and any foreign nation violating the code of ethics is entitled to be classed as a gambler who welshes on his debts, and put on the black list. Before starting an argument one should be sure his premises are correct. The engineer claims that we did not ship France gold or packages of bills, but opened up credits by which the French bought here munitions and supplies for which we charged highly inflated prices and made enormous profits and by this means we now are the richest country in the world.

This is not at all complimentary to the American public which suffered compulsory conscription of its young men to go and shed blood for France, to give money "till it hurts," to do without white bread for three years, and sugar, that grain and alcohol be supplied, because of Lafayette. But to return to the subject of this four billion dollars of debt owed by France: it was virtually money shoveled out of the United States treasury *after* the war was over, through a misguided sentiment of succor to the wounded victors, who appear promptly to have begun building a "balance of power" for militaristic purposes, sponsored by Clemenceau and Poincare, loaning our money out to Poland, Czechoslovakia, and to other powers.

This American fund and twenty billion besides had been borrowed from the people of the United States, rich and poor alike, and is a burden on the backs of our future generations, compelling the heaviest taxes on their earning powers. Our money was loaned to France not as a war "ally" but as a nation worthy of faith in her intention to pay with interest. Mr. Adams and Monsieur Loucheur err in classifying the French debt as an Inter-Allied debt, as President Wilson was always careful to insist the United States was not in the war for annexations and indemnities.

The attitude of France as expressed on Oct. 27, 1923, by M. Loucheur, alluded to by Mr. Adams, was so preposterous that I saved the article attributed to him in his interview and quote some of it:

"Americans, especially the American people who are hardest to convince, must know that their war debts cannot be recovered. No system can be created permitting the payment of Inter-Allied debts. Consider the American proposition that we amortize our debt in fifty years with interest at 3 per cent. This means that France would have to pay $200,000,000 annually for the first few years. Well, where do you think France is going to find the $200,000,000? For France to find such a sum, it would be necessary for America to inflate her currency so as to make the dollar cheaper for us to buy. Poincare himself said 'For our part we would be content with 26 billions of gold marks from Germany, provided the Allied debts are cancelled.' It will be objected that England agreed to pay its American debt. Baldwin made a sorry bargain for his country. In conclusion, the creditor nations cannot claim anything from France until the latter has collected from Germany.

"Even then, if France collects the maximum possible from Germany, she will not pay America."

Comment on this is scarcely necessary, as we will hardly comply with the French idea to reduce our dollar to the extent it can be bought with a 5c. franc. As to where and how France can get $200,000,000 annually, let her get it by taxing estates, excess profits, absinthe, theaters, cosmetics, and the like.

Mr. Adams states that we have half of all the gold in the world and that the gold production of the world, outside of the United States, is practically all from the British Empire. He might as well have included the United States, as today the Rand and Canada are the chief sources of supply of the yellow metal. That such is the case in the metal-mining field is due to the foresight and economic policy of the British Government subsidizing and fostering the prospecting for and development of metal mines wherever they may be in the world—a policy the United States is backward in awakening to even in its own borders.

The pendulum of national wealth may swing away from us; we should collect from our creditors. An act of Congress should be passed prohibiting the flotation of loans in this country by a debtor nation or corporations of that nation unless satisfactory debt refunding be arranged for. Let us stop sending good money after bad. As the war debt issue stands today in America it is "hats off to honorable old England!"

with respect. G. W. SCHULTZ.

Mertztown, Pa.

A Brand New Doodle-Bug Factory

THE EDITOR:

Sir—Down in Elgin, Tex. (Box 87), one T. D. Robinson has not only broken ground, but has actually finished and put on production a new series of mineral rods and hidden-treasure finders of a unique pattern and style, coming in two models, to wit: the de luxe edition, or the swinging type, and the common edition,

or dip type. Advertisements are being broadcast and appearing in many local newspapers in the Southwest, and it is reported that many are being sold among miners and prospectors, as well as farmers, the latter using them for hidden treasure where ancient Aztecs, or Apaches, or Spaniards, or bandits are supposed to have secreted loot and gold. The price is $25, with a guarantee of all your money back, after three days' trial, if not satisfied, or at a price of $20, in lots of five or more.

The literature and correspondence from the factory, while startling and flaming, still is too voluminous to quote in total, although we wish that we might give it all in this summarizing.

It appears there has never yet been put out a mineral rod of the efficiency of this one, and the method of its construction is unique among all the host of its predecessors, excelling even the famous pear-shaped globe from Finland, as described in the *Engineering and Mining Journal-Press* of June 4, 1921. The principle of its functioning, performance, and assembling will form an interesting chapter to the series of Bed-time Stories for Mining Engineers"; but we are coming to that.

Briefly, from the maze of detail, we are able to gather that the two brass compartments contain two types of ingredients. One is a secret (known only to the inventor and an ancient chemist in Finland) compound made in Finland, of so subtle and mystic a nature that it defies analysis, yet impotent in or by itself. But the most startling announcement is the nature of the contents of the second compartment. Will the wonders of the world ever cease; or the aspirations of man, ever reaching upward, know no limit! The second compartment is filled with the ether of stellar space! Think of it, mining engineers, scientists and others! Filled with the ether of the deep blue skies, subtly compounded with other ingredients. It may be asked how it is arranged to secure this ether fluid out of the high blue; but it is quite simple after all. Ben Franklin furnished the inspiration. Yes, by a simple kite it is secured. Light flasks, from which the air has been voided, and which have patented spring stoppers controlled from the ground by a second string, are sent high up in the azure blue, high as the kites can take them on windy days, where the air is rich in ether; then the patent stoppers are pulled open and in rushes the richly ether-laden air, filling the bottles, which are then closed by releasing the second string. But it is well known among scientists and some others that a kite cannot reach the high-grade zone of the ether—the region on high, of secondary enrichment, as it were, of stellar ether; oh, no! the inventor does not advance any such preposterous claims; but the laboratories at Elgin, Tex., have devised methods of concentration, whereby the gross air and other tailings are largely eliminated by subtle distillation and redistillation until the deep blue, almost pure ether, is reduced to a liquid. Of course, it is well known that the sky owes its blue color to the presence of ether. But we are forgetting to tell the essence of how metals and treasure are found thereby, deep in the intestines of the earth.

Though the inventor is a little vague at some points, fearing, no doubt, that by divulging too clearly, others may copy his machines or solve the secrets thereto, still it appears that there is a magnetic tension between all metals (and treasures) and the ether of the deep blue sky, varying in direct proportion to the concentration of the ether. But this affinity is weak, normally; hence the concentrated ether. But this force is static in its nature and requires an exciter to convert it into an active agent, manifesting as a physical force. Now, each and every metal has its own separate type of vibration or mode of attraction to the ether (stellar ether), so it is necessary, in order to make some excitement, to have, in addition to the concentrated ether, a small portion of the particular metal or treasure that is sought for; that is, if one is looking for copper, there is a cut-off for copper, in which a piece of copper is inserted; if one is looking for doubloons or pieces-of-eight, one must be provided with samples of these to insert in the cut-off of the instrument. Now is where the exciter chemical comes in (from Finland); this subtle drug sets up an active force, converting the static into an active functioning current, which casts about, seeking its affinity in deep-lying bodies of metals, ores, or hidden treasure. When it finds its objective, the phenomenon is made evident by a strong pull of the instrument toward the hidden treasure or ore. It is really quite simple after all, and the only mysterious part is the secret, potent, mystic compound discovered by the a.c. (ancient chemist) in Finland.

It is noted in the beautiful language of the literature from the factory that the instrument is provided with a number of "cut-offs" for lead, zinc, coal, gold, copper, mica, iron, aluminum, fluorspar, and others. It is also rather interesting to note that this wonder machine will detect not only aluminum ore but bodies of metallic aluminum, deep within the bowels of the earth. It is regrettable to think how many orebodies of metallic aluminum have not been brought to the use and benefit of mankind because of these instruments not coming into general use heretofore. But compose yourself to listen still further. If one inserts a piece of fluorspar in one of the cut-offs, the machine will not only detect the ores of fluorspar but also any bodies of pure metallic fluorine that may be lodged in any hidden veindike. It is claimed that the instrument will strongly "detect" to a depth of 1,000 yards and further. As for mica, no flake can be hidden in the deepest granite but this instrument will react to it. Heretofore only the oxidized form of mica has been mined economically, but it is now hoped that by the judicious use of this instrument, bodies of the purer metallic mica will be discovered, redounding to the benefit of all humanity, for the absence of cleavage in the metallic form will render it invaluable for many uses.

Though this instrument has not been thoroughly tested for petroleum, the inventor is perfecting it in this respect, and there is no reason why it will not be far more potent than any of those crude oil finders which come out from time to time, since none of them have had the ether compound in them, and no doubt this instrument will soon have found the remaining undiscovered oil fields of the earth.

As Brother T. D. Robinson (Box 87) may raise the price at any time (the price of $25 is merely an introductory offer) it is suggested that all mining engineers and others send in their orders early, to Elgin, Tex.

Ah, how marvelous are the diversities and achievements of the human mind, groping in the realms of science, even to seizing out of the far blue the subtle ether of the stars!

ALFORD ROOS.

Vanadium, N. M.

Consultation

Size and Design of Electrolytic Refineries

"I am in charge of a copper mine and a smelter in Asia. Both the mine and the smelter are on a very small scale. In fact, the mine was started under my direction, fourteen months ago, and the smelter began to produce copper one month ago. The general conditions are satisfactory. Among the many problems that await solution there are two upon which I would like to have your opinion. They are: 1. What is the smallest unit of electrolytic copper refining plant with silver and gold separation equipments? Our blister copper contains about 30 to 40 oz. silver and 2 to 4 oz. gold per ton, and our daily capacity is about 2,000 lb.

"2. At the mine there is a large body of low-grade ore, assaying 2 per cent copper, in the form of chalcopyrite chiefly, and bornite and chalcocite secondarily, but pyrite is particularly missing. The distance between the mine and the smelter is about 30 miles. Is this ore suitable for roasting with subsequent sulphuric acid leaching? I would like to have some data as to the cost of small leaching units? Are there any manufacturers in the States, who offer standard leaching equipments in the market?"

So far as the precipitation of the copper goes, an electrolytic copper refinery could be run economically on even as small a scale as one ton per day, but the accessory equipment necessary would not permit the economical operation of such a small plant. The usual electrolytic refinery, for example, has several hundred tanks for precipitation, but may have only one or two furnaces for casting the anodes or for melting up the cathodes. A commercial plant would hardly be built with a capacity of less than fifty tons per day. The expert supervision required for the various steps of the process, and for the separation of the gold and silver, also makes the overhead unduly large when operating on a small scale.

It would seem that the ore you describe could be roasted and leached without trouble, though whether this treatment would be more economical than concentrating and smelting, depends upon many factors unknown to us. We have no data from which you could estimate the cost of a small leaching plant in Asia. There are no manufacturers of complete electrolytic refinery equipment and leaching plants as such. Each plant is designed and generally constructed by the operating company. The only articles purchased are pumps, motors, cranes, chain blocks, piping and other apparatus. In heap leaching the equipment consists mainly of leaching tanks, pumps, and acid-proof pipe. The problem is one for a consulting engineer to solve. No satisfactory ready-made plant is available.

Suggestion for Handling Concentrates

"Under the heading of 'Consultation,' in the Jan. 31 number of *Mining Journal-Press* there is an inquiry from Mexico relative to transporting about 15,000 tons of tailings 15 miles, and airplanes were suggested.

"May I suggest pumping the material the entire distance. If power and water are available, 6-in. sand pumps can be used and about one thousand tons of the tailings can be transported per day. The number and location of the pumping stations would be dependent upon the topography of the country, but as many as six pumps in series may be used at any one station. This means the material could be moved over a vertical lift of about 600 ft. or over a straight horizontal of about 7,000 ft. per station. If the delivery point is below the receiving end, gravity can be taken advantage of and the number of pumps and the amount of power will be reduced. Without knowing the details of the proposition, I cannot give an estimate of the cost, but where power is cheap and water is free it figures very favorably with railroad transportation.

"If not sufficient power is at hand one can pump, say, 500 tons part way today, and tomorrow pump it the rest of the way—or can pump only when the load on the power house is normally light.

"A 6-in. line is the smallest that can be used, because a velocity of 10 ft. per second must be maintained and the friction head amounts to an excessive item when using smaller pipe.

"I appreciate this is a radical suggestion, but nevertheless it is entirely practical."

Concentrates are now being pumped by the Magma Copper Co. at Superior, Ariz., from mill to smelter, and the method is thoroughly practical.

Singling and Doubling in Antimony Smelting

"Please inform me what the terms 'singling' and 'doubling' mean as applied to the smelting of antimony ores."

In the production of metallic antimony from rich stibnite ores or from liquated sulphide the antimony sulphide may be reduced by iron according to the following equation:

$$Sb_2S_3 + 3Fe = 2Sb \times 3FeS$$

This operation may be conducted either in crucibles or reverberatory furnaces. The reduction in crucibles takes place in three stages (this is the general English practice), known as singling, doubling, and refining or frenching. In singling, the antimony sulphide is reduced by wrought-iron scrap, the metal product being called "singles" and contains about 90 per cent antimony. Other ingredients such as salt are added to help.

In doubling, the crucibles are filled with singles, some liquated sulphide and more salt. After fusion the metallic product is known as "star bowls"; fusion brings the grade up to 99.5 per cent or better.

When the star bowls are mixed with flux and liquated sulphide and given further treatment, a product known to the trade as "star" antimony is the result. This is the last stage or frenching of the metal. It is interesting to note in passing that the trade insists usually in having a grade of antimony which exhibits a starred surface, although it has been demonstrated that grades of antimony without this characteristic are just as pure.

Cost Data of Truck Haulage Desired

"Can you give me any data on the cost of transporting mill concentrates or ores by motor truck, caterpillar tractors, and wagon for long hauls to railroads?

"Have you any data at hand on the cost per mile of construction of narrow-gage railroads over moderate topography?

"I would very much appreciate any information you can give me in regard to these problems."

(Inquiry from Arizona)

Perhaps some of our readers who have had experience in motor truck transportation for ores and supplies will be glad to tell this inquirer of the results and costs.

News of the Week

The Mining News of ENGINEERING AND MINING JOURNAL-PRESS is obtained exclusively from its own staff and correspondents, both in the United States and in foreign fields. If, under exceptional conditions, material emanating from other sources is published, due acknowledgment and credit will be accorded.

Summary

C. F. KELLEY, returning from South America, states that the Chile Copper Co. is now producing at the rate of 20,000,000 lb. per month. Cable advices from Europe place the production of Union Minière for February at 12,971,000 lb. Last summer Chile produced about 16,000,000 lb. per month and Union Minière in August passed the 20,000,000-lb. mark.

A new gold dredge is being built by the Las Dichas Mining Co. near Valparaiso, Chile.

The U. S. Tariff Commission has decided to reopen hearings on crude and caustic calcined magnesite.

The Federal M. & S. Co. will start extensive exploration of its Corrigan property in Idaho.

Unmounted hammer drills for stoping have made a remarkable reduction in the labor cost in gold mines on the Rand in South Africa.

Noranda Mines, Ltd., is expected to build a 500-ton copper smelter near its properties in northwestern Quebec.

The Couzens Committee's testimony regarding copper and silver-mine valuation is attacked by the American Mining Congress.

Federal M. & S. Co. Will Explore Corrigan Property

Zinc Situation Alters Outlook—Swedish-American Prospecting Co. Found Dike, Not an Orebody

The Federal Mining & Smelting Co., of Wallace, Idaho, will soon start development of the Corrigan property, west of Kellogg, which was the scene of extensive operations many years ago under former Federal management. A shaft was sunk 600 ft. following the vein, and levels were opened which disclosed a fair tonnage of lead-zinc ore. At that time there was no market for zinc, and even if there had been, the milling methods of that day were not adapted to the separation of the minerals. It was therefore unprofitable to ship the lead, on account of the penalty imposed by the smelters because of the high percentage of zinc.

Conditions are different now, and if the tonnage is sufficient both the lead and zinc can be mined profitably; but a more attractive feature of the Corrigan is the probability of finding a parallel vein carrying a body of lead-silver ore free from zinc. This is indicated by the old maps and records of the workings, from which it appears that this parallel vein was penetrated by a diamond drill from the shaft, disclosing four or five feet of lead-silver ore. A crosscut will be run following this diamond-drill hole. Operations will begin as soon as equipment is delivered, and will include exploration of the old workings as well as the crosscut.

The Corrigan was brought to public attention last summer through efforts to discover an orebody by the Swedish-American Prospecting Co. by electrical prospecting. This company was successful in identifying a mineral area, but it proved to be a mineralized dike, the presence of which had long been known. The result was therefore of no value and has no connection with present development plans.

Chile Producing 20,000,000 Lb. per Month, Says C. F. Kelley

C. F. KELLEY, president of the Anaconda Copper Mining Co., returning from Chile says that the Chile Copper Co. is producing at the rate of 20,000,000 lb. of copper per month. He also visited the Andes property, where large-scale construction work is about to start.

Mr. Kelley says: "I am satisfied consumption and demand will grow to meet the program we have set. I do not look for any export tax to be placed on copper out of Chile. The revolution there is purely local. I found everything in exceedingly good condition."

Cripple Creek Production $417,356

Production from the mines of the Cripple Creek district for the month of February totaled 35,288 tons, with a gross value of $417,356. This is a slight decrease in tonnage from the preceding month, but an increase in gross value. The Golden Cycle mill treated 19,000 tons of ore, of an average value of $19, and the Portland mill 16,288 tons, averaging $3.46. Lessees are busy in the district.

Ore, Not Concentrate, Determines Taxable Output of Colorado Mine

Standard Chemical Co. Gets Refund As Consequence of Supreme Court Decision—Produces Carnotite

The long-drawn-out controversy between the Standard Chemical Co. and the county assessor of Montrose County, Colo., has terminated favorably to the mining company as the result of a decision handed down by the state Supreme Court on March 2.

According to the Colorado law, the value of producing mining property for taxation purposes is determined by production, the valuation being fixed at 25 per cent of the gross for the preceding year, unless the net exceeds that amount, in which event the net becomes the factor.

The Standard Chemical Co. operated carnotite and vanadium properties on an extensive scale in Montrose County, and the assessor, in determining the value of the property for taxation purposes, attempted to use the output of concentrates from the company mill as a basis of valuation instead of the crude ore taken from the mines.

The company filed a schedule showing a production of 6,021 tons of ore extracted from its mines in 1921, of a gross value of $120,000. The assessor changed the schedule from 6,021 tons of ore extracted to 1,281 tons of concentrates produced at the mill, valued at $768,600, making an increase of approximately $6,000 in taxes for the mining company.

The state Supreme Court sustained the contention of the mining company, and ordered a refund of the excess payment.

New Gold Dredge in Chile Nears Completion

A. C. Ludlum Discusses Las Dichas Mining Co.'s Plans—May Revive Gold Mining

WHAT may mark the beginning of a period of large-scale gold placer exploitation in Chile is the construction of a modern dredge by the Las Dichas Mining Co. in the Casa Blanca district 60 miles southeast of Valparaiso. According to A. C. Ludlum, whose company, the New York Engineering Co., is building the dredge, construction is well advanced, and operations should start in July. The dredge is of all-steel design; it will have 6-cu.ft. buckets, with an estimated capacity of 100,000 cu.yd. per month.

The dredge is especially designed to handle a large amount of sand and clay overburden which carries no gold values. It is so arranged that this barren sand and gravel is passed rapidly through the dredge without being washed or run over the gold-saving tables. When the pay gravel is encountered it is then washed by the usual method. The change from one method to the other is made in a few minutes.

According to the estimates of the engineers for the Las Dichas Co. about 9,000,000 cu.yd. of dredging ground containing 34.33c. per yard has been developed by churn drilling and shaft sinking. The average depth to bedrock is about 35 ft. The thickness of the "pay" stratum is about 3 ft. Four 4-in. Empire drills have been at work since January, 1923, more than 380 holes having been sunk to bedrock. The results of these holes were verified by test pits dug at the same points.

S. Hamm, engineer for the Las Dichas company, and Paul Parker, an American dredge engineer, who visited Chile to consult on the enterprise, agree that the operating conditions are excellent. The gravel is loose and easily handled, few boulders are to be found, and sufficient water is contained in the ground for all operating purposes. The climatic conditions are ideal, being free from excessive cold or heat. Transportation is good, a splendid automobile road running from the seaport of Valparaiso direct to the property.

It is proposed to operate the dredge with electric power, the current to be obtained from the Cia. Chilena de Electridad, which operates a large central station at Valparaiso. A reasonable contract is said to have been closed with the power company. Estimated costs are 10c. per yard, which should provide a good working profit provided the calculated gold content is realized.

Another placer deposit is being prospected by Nelson Dickerman, an American engineer, at Carahue, several hundred miles south of Valparaiso. Here he has two Empire drills at work, and if results are satisfactory hydraulicking on a large scale is projected.

Chile in the days of the Spanish conquest was one of the leading gold-producing countries. In more recent years, chlorination and cyaniding have been tried, with varying success, on lode ores, and some gold has been won by desultory placering; but the output from gold ores has not been large. Chileans, according to Mr. Ludlum, hope for a revival of gold mining through the medium of dredging and other economical methods of large-scale placer operation.

Rolling hills, 60 miles from Valparaiso, Chile, where a modern gold dredge is now nearing completion

Officials of the Las Dichas Mining Co. inspect the steel structure that will be their dredge

Pickands, Mather Seek Siliceous Ore on Marquette Range

Pickands, Mather & Co. have secured a lease on the lands of the Volunteer Co., near Palmer, on the Marquette range, in Michigan, and have started three diamond drills at work. It is hoped to prove up a deposit of low-grade siliceous ore, and the indications are favorable, as much ore of this grade shows on the surface.

The Palmer district has been active for the last two seasons, and now has several open-pit mines producing siliceous ores. The Cleveland-Cliffs Iron Co. has two drills at work on lands which it owns near Palmer, and the M. A. Hanna company is preparing another tract for mining. There will be two and possible three new pit mines there the coming season. One underground mine, the Isabella, is also operated by Pickands, Mather & Co. The open-pit properties which have shipped for the last several summers are the Richmond and Empire, of the Hanna company, and the Maitland, of the Maitland Mining Co.

Each year, for several years now, the furnaces have been taking more low-grade siliceous ores, and about 1,000,000 tons is all that the market can absorb at present. Practically all of this tonnage comes from the Marquette range, at Palmer.

One Option Given, Two Closed in Joplin-Miami Field

A revival of mining operations in the Lawton, Kan., section, of the Joplin-Miami zinc-lead field may result from the recent optioning of the Eastern L. & Z. Co.'s mine at that place to representatives of the United States Steel Corporation. The property was last operated some years ago by Walter Ragland, of Webb City, and was a steady producer. It consists of a mill and 520 acres of land.

Frank Childress and associates have closed their option on the St. Joe property, in the heart of Picher, Okla. Most of the mining on this property has been conducted on the west half of the lease, which consists of forty acres. Recent good drill strikes have been made on the east twenty.

The Mahon interests, of Miami, Okla., have closed their option on the State Line mine, north of Picher, on the Kansas-Oklahoma line. The property was obtained from the S. R. & W. Co.

Portland Gold Pays Off Debts; Buys New Equipment

All indebtedness against the Portland Gold Mining Co. was paid off during 1924, according to the annual report made at a meeting of the stockholders held Feb. 16, 1925.

In the second half of the year the cost of new machinery and development exceeded the value of the ore extracted from the company's mines.

The 3,000-ft. station in the Independence mine at Victor has been completed, and is ready for the installation of the pumps; and, within the next month or two, connection should be made with the main ore vein, which is said to be very rich at the 2,700 level.

A statement by J. W. Ady, Jr., managing director of the company, says that during 1924 the Portland group of mines produced ores valued at nearly $1,500,000.

Driving Florence Lake Tunnel, 13 Miles Long, Requires 1,773,000 Man-shifts

Huge Project Completed at Cost of $17,000,000—Maximum Progress 692 Ft. in One Month

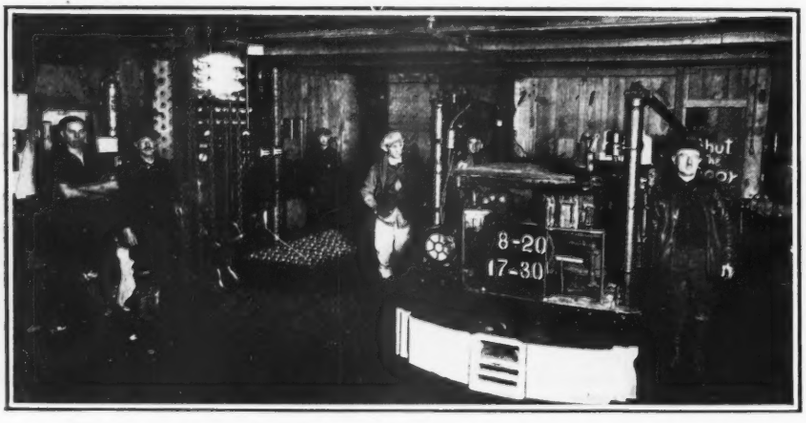
THE last section of the 13-mile Florence Lake tunnel on the Big Creek project of the Southern California Edison Co. was completed on Feb. 18, 1925. The tunnel is under Kaiser ridge, near Huntington Lake, Fresno County, Calif. Active construction work was started in the summer of 1920. The cross-section of the tunnel is 15 ft. wide and 15 ft. high, to the top of the arch. A total of 1,773,000 man-shifts was required for the construction. The best record was 692 ft. in one month. The number of men employed ranged from 500 in 1920 to more than 2,000 in 1924. Work was from six faces or headings, a condition which was made possible by the driving of two side adits at two points where the topography favored. Explosives used totaled 5,200,000 lb. and drill steel 1,150,000 lb. An estimate of the supplies required during the progress of the work is 60,000 tons.

Heading in the Florence tunnel of the Big Creek hydro-electric project

The tunnel is unlined for the most part. The rock is hard—principally granite. A heading and bench was driven at each face, from thirty-six to forty-two holes being required in each heading round. The bench round, consisting af fifteen holes, was drilled by four or five drills mounted on short arms attached to a crossbar. Drill steel used was 1¼-in. round; starter bits were 2¾ in. and ¼-in. gage changes, with drill steel lengths in multiples of 2 ft. In drilling a round from seven to eight tons of drill steel was handled, and steel consumption amounted to 15 to 20 lb. per ft. of tunnel.

The heading was kept 10 ft. in advance of the bench. Two 10-ft. rounds were shot at the heading for one 20-ft. round at the bench. The second heading round was fired simultaneously with the bench. Electric blasting caps were used; and 60 and 40 per cent low-freezing gelatine dynamite in 1¼x 8-in. cartridges. The tunnel was ventilated by a 24-in. wooden stave pipe suspended from the roof by brackets. By using the fans as exhausts the heading was in workable condition in from thirty to forty-five minutes after blasting.

Cars of 4 to 6-cu.yd. capacity were used in handling the rock and power shovels operated by compressed air were used for mucking. Combination storage and trolley-type electric locomotives were used. The tunnel will deliver water from a drainage area of 175 square miles to Huntington Lake, from which it will be delivered to a number of hydro-electric power plants. The total cost of the construction is given as over $17,000,000. The tunnel is noteworthy both for its large cross-section and great length and the rate at which it was driven.



Motor "stable," where storage-battery locomotives were "fed" for work on the Florence tunnel

Jardine Netted $4,240 from Gold and Arsenic in 1924

The annual statement of Jardine Mining Co., operating at Jardine, Mont., for 1924 shows a net income of $312,000, and operating expenses of approximately $308,000, leaving a profit of $4,240. There was on hand at the end of the year approximately $50,000 of finished products, principally arsenic.

The company expects to enlarge its concentrator and arsenic plants. Heretofore, the roasted concentrates have been shipped to the smelter. However, in the future it is planned to cyanide these concentrates, for the gold content, and to reconcentrate the tailings from the cyanide plant, so as to recover the tungsten.

Would Make State Mineralogist Head of Mines Department

Assembly Bill No. 470, introduced in the California State Legislature, proposes to substitute for the office of State Mineralogist a State Department of Mines and Mineral Resources, the State Mineralogist to become the director of the department. All mineral producers are to be included within the scope of the proposed legislation. Two new sections provide for the taking over of the leasing of mineral lands and the making of geological examinations for the State Corporation Department in connection with the granting of permits to sell mining stock.

Start Big Project to Join Chino Pits

Preliminary work on the construction of a new channel to carry the water from Santa Rita Creek is now under way at the Chino mines of the Ray Consolidated Copper Co. in Santa Rita, N. M. Buildings are being removed to new locations, and a steam shovel is engaged in cutting a new course for the stream. This new channel will extend round the rim of the Romero, Whim Hill, and Chino pits on the north and west, cutting back into the old creek bed below the townsite and pits. A lining of reinforced concrete will be provided and a new road will follow along the edge of the flume.

This work is the beginning of a large project which has for its object the eventual joining of the two large pits now separated by the main highway through the town of Santa Rita, a plan involving the eventual moving of the shops, office buildings, and dwellings now situated in what is known as the downtown district, and necessitating a new location for the railroad station and main townsite.

Enormous Drop in Katanga Copper Output

CABLE ADVICES from Europe state that the February output of the Union Minière du Haut-Katanga was 5,791 long tons of copper. This is equivalent to about 12,971,000 lb., and compares with 16,139,000 lb. in January and 11,645,760 lb. in February, 1924. Union Minière reached the high point in August, 1924, when 20,045,000 lb. was produced.

Myers Obtained Gold Filings, Bingo Testimony Shows

The preliminary hearing of the case against Joseph Myers, managing director of the Bingo mine, in the Herb Lake district of northern Manitoba, charged with issuing fraudulent statements, was resumed in the Winnipeg police court on March 5. T. Dawson was called as a witness for the prosecution and testified that he had been approached by Myers, who asked him to file down some brass. Myers also produced two pieces of gold which he wanted Dawson to file and mix with the brass. One piece, the witness stated, was about an inch square and the other looked like a mutilated coin. Two phials were given him by Myers, who requested that the filings might be placed in them. He completed the job at home, and on handing the filings back to Myers received $10 for his work. In July, 1923, Myers brought him some more gold to file and again he was paid the same amount on delivery of the filings. After a technical argument between counsel on the production of documents, Myers was remanded for later hearings.

Tintic Milling Co.'s Dump May Go to International Smelter

The International Smelting Co. is shipping material from the dump of the Tintic Milling Co. at Eureka, Utah. It is understood that 500 tons will be sent to the smelter for trial, and that if this proves satisfactory, more of the dump ore will be taken. The tailing is left from treatment by chloride roasting and leaching of various Tintic ores.

Hartley Mine Pays for Self in Four Months

The S. R. & W. Mining Co., which took over the Hartley mine of the American Metal Co. in the Joplin-Miami field, in co-operation with the Consolidated Lead & Zinc Co., announces that the four months' operation of the property, which was abandoned by the American Metal Co. as worked out, has brought net profits sufficient to pay for the mill and other property figuring in the deal. Homer Seals, principal in the S. R. & W. Co., has had long experience in this field in rejuvenating worked-out properties, and has been particularly successful in recent months in this sort of operations.

Union Minière Plans 440,000,000-Lb. Annual Copper Production by 1932

Inadequate Transportation Is Big Stumbling Block—Belgians Jealous of Outside Acquisition of Shares

GRADUAL INCREASE at the rate of 12 or 14 per cent annually to a yearly output of about 440,000,000 lb. of copper is the program outlined at a special meeting of the Union Minière du Haut-Katanga held recently. Inadequate railway transportation as well as the limited capacity of the metallurgical plants will restrict the rate of copper production.

The early completion of the Lobito Bay railway, will help greatly. To complete the remaining portion of the road which Tanganyika Concessions is building, through Angola to the Belgian Congo border, will cost about $5,500,000, and construction is now to be rushed. From the border to the mine, a distance of 460 miles, a connecting road is to be built by the Belgian Congo government.

Owing, in part, to the present difficulty of transporting supplies, no work has been done on this final section as yet. It is assumed that it will be carried forward after the line from Benguela has reached the border and can deliver the necessary construction materials. If this plan is to be followed it is unlikely that through transportation over this line will be established in less than three years at best.

The plans for Katanga's large copper-leaching plant, and also for a hydroelectric installation on the Lufira River, were completed in 1923. Electrolytic copper already is being produced in a small way at the property, and it is from this department of its operations that the future big increases of output will come. Sulphuric acid will be made at the property from sulphide ores already developed. The very high grade of much of the ore to be leached, 40,402,700 tons of it averaging 5.82 per cent, should make possible low production costs after direct, adequate, and cheaper transportation is available.

It is said that Belgian Government and certain other Belgian holdings of Katanga, aggregating 53 per cent of the capital, are in effect pooled for several years to come. These interests are determined to prevent control from leaving Belgium. In view of this, the prices for recent new issues of stock apparently were fixed by these Belgian holders, who, together with Tanganyika Concessions, will be entitled to subscribe for nearly 90 per cent of it. Sale of these shares will net Katanga about $7,300,000, which should go a long way toward paying for the completion of its leaching and flotation plants.

American Eagle Shaft Sunk 600 Ft. in Eleven Months

Sinking of the American Eagle shaft, of the Stratton Estate, at Cripple Creek, Colo., from the fifteenth to the twenty-first level, a distance of 600 ft., in approximately eleven months, was one of the fastest records ever made in the district. The sinking was completed on March 7, and about ten days will be required to install the station, preparatory to the starting an extensive system of exploration and development to be conducted from this level.

Several hundred feet of crosscuts and drifts on the seventeenth level have been driven. Drifts on both the Rice and Wilson veins are being driven, with the probability that the latter heading will be under the former lease of Baskett & Luce within the next thirty days. The Baskett & Luce lease was the sensation of the American Eagle a few years ago. Exceptionally rich ore is said to be exposed in the bottom of a winze below the fifteenth level, and toward this the Wilson drift is being driven. The drift on the Rice vein also is now entering territory where ore may be expected in any round.

Patino Tin Mines Earned £815,608 in Nine Months

Earnings of the Patino Mines & Enterprises Consolidated, which operates the largest tin mines in Bolivia, totaled £815,608 for nine months ended Dec. 31, 1924, after providing for taxes, depletion, and other reserves. The company has declared a dividend of 5s. a share, payable March 5 to stock of record Jan. 24. A similar dividend was paid Nov. 5 last. Simon I. Patino, known as the "Bolivian Tin King," is president of the company; and Edward J. Cornish, president of National Lead Co., is vice-president. It is expected that the Patino Mines stock will soon be listed on the New York Stock Exchange.

Bingham Mines Co. Shipped 55,681 Tons of Ore in Utah

The 1924 report of the Bingham Mines Co., which operates in the two camps of Bingham and Eureka, Utah, after deducting $91,048 for prospecting and development, shows profits amounting to $261,507 without deductions made for depreciation and depletion. Of these earnings $187,000 was made during the last four months of the year, chiefly from ores furnished by the Victoria mine at Eureka. The orebodies opened in this property were of prime importance in the year's development. The Eagle & Blue Bell at Eureka showed decreased earnings, owing to the low grade of the ore, but there is still new ground to be developed here. The American Star, also of Eureka, showed a small profit. At the Dalton & Lark mine in Bingham, lead-zinc deposits of importance were developed, and these added to earnings. There was shipped from all of the properties of the company 55,681 dry tons of ore, net smelter returns from which amounted to $923,139.

Idaho "Blue-Sky" Law Strengthened as Regards Mines

Advocated by Mining Interests—Provides for Filing Copies of Promotion Documents

A law just passed by the Idaho Legislature compels the seller of mining shares to file copies of prospectuses or other "literature" to be used in promoting sales with the state Inspector of Mines. The law was supported by legitimate mining interests.

The present Idaho "Blue-sky" law requires that all investment companies that desire to sell their securities in Idaho must obtain a permit from the Commissioner of Finance. This law specifically exempts mining companies from these provisions, but requires that they file formal reports of operations with the Inspector of Mines. No procedure other than the filing of this report is required of a mining company before selling its stock.

This new law does not give the Inspector of Mines additional authority, nor does it give him any power to censor the publications filed. It merely provides a method whereby he is officially informed as to what printed matter is being used to advertise the sale of stock. Mining companies will still continue to be in a position more favored than that of all other investment companies. The law reads:

"Any person, corporation, domestic or foreign, or any association engaged in mining operations or holding mining property within the state, which is actively engaged in offering, selling or attempting to sell any stocks, bonds or other securities of any kind or character, and which is publishing or distributing, or permitting to be published or distributed, any book, prospectus, notice, report, circular letter, advertisement, or other publication concerning the mine, property, financial condition or affairs of the corporation or association which is designed to sell, assist or further the sale of any stocks, bonds, or other securities of any kind or character, shall file copies of all such books, prospectuses, notices, reports, circular letters, advertisements or other publications with the inspector of mines as soon as such books, prospectuses, notices, reports, circular letters, advertisements or other publications are prepared for publication and before the same shall be distributed or publicly exhibited.

Upon the neglect or refusal of any person, corporation or association, or his or its agent, to comply with the provisions of this section, he or it shall be deemed guilty of a misdemeanor, and upon conviction thereof shall be punished by a fine of not less than $100 nor more than $2,000, or by imprisonment in the county jail for not more than ninty days, or by both such fine and imprisonment, at the discretion of the court; and each day's continuance of such neglect or refusal after the publication or distribution of such book, prospectus, notice, report, circular letter, advertisement, or other publication shall be a separate offense. The prosecuting attorney of the proper county shall commence and prosecute to final determination in any court of competent jurisdiction an action at law to enforce this penalty."

Candelaria Reports New Ore

New discoveries of ore are reported by the New Candelaria Mines Co. operating at Candelaria, Nev. Mine development work will be required to determine the extent of these discoveries, but the management is encouraged.

The mill is reported to be running smoothly, and 100 tons per day are treated. Some stope fills are being screened, and a part of the daily tonnage is obtained in this manner.

New Electric Hoist for Iron King

New electrical hoisting equipment has been ordered and will be installed at the No. 2 shaft of the Iron King mine at Eureka, Utah, as soon as the present job of shaft sinking is completed. This is a double compartment shaft and the hoist that has been in use is not heavy enough.

One Hope for Extension of Joplin-Miami Fields Seems Gone

THERE seems reason for believing that the promised extention of the Joplin-Miami district at a point directly northwest of the northwestern part of the Picher-Treece mineralization will not prove to be possible. The Federal Mining & Smelting Co., one of the largest producers in the field, has given up its leases in this section after prospect drilling extending over a number of months.

Activity in the area was started some months ago when the Underwriters Land Co. brought in a good drill hole at a depth of about 350 ft. on a lease directly north of the Lucky Jew mine, now owned by the Eagle-Picher Co. Immediately there was a rush for leases in the territory, the Federal, Quapaw, and Lawyers interests being most successful in obtaining them. Both the Lawyers and the Quapaw have had difficulty in completing drill holes, owing to the formations encountered. Neither company has as yet obtained good enough drill holes to justify shaft sinking to the 400-ft. level, and since the Federal has withdrawn it is considered likely that development on a large scale will be discontinued, for the present at least.

Toronto Letter

By Our Special Correspondent for Northern Ontario

Railway from Larder Lake to Rouyn Is Assured

Noranda Expected to Build 500-Ton Smelter—New Mine Tax for Quebec

Toronto, March 14.—The Ontario Government has announced its intention of building a railway into the new Rouyn district of northwestern Quebec. This road will be the extension of the government Larder Lake branch and will require about thirty-seven miles additional construction. It is understood that work will be started immediately and it is hoped to have the new line open for traffic next December. In announcing the extension the Premier pointed out that though the road would go out of Ontario, it would be to the advantage of the province and to all of Canada. It is expected that a smelter will be built in Quebec, close enough to the Ontario line to permit of the economical treatment of Ontario ores.

There is a section about 10 miles east of the Quebec line where the forest has been burned, for many miles, so that the damage from smelter fumes would amount to very little. It is understood that the Noranda Mines Co. will build a 500-ton smelter. The annual report of the company is expected soon, and will show proved ore reserves having a gross value of $12,000,000. The average value is given as $20.29 per ton. Of this, gold accounts for $5.17 and copper for the remainder. The average copper content is 5.66 per cent. If, however, the indicated ore were to be included, it is believed that the value would be at least double the present estimates.

The Minister of Mines for the Province of Quebec will soon present to the legislature a new Mining Tax Act patterned along the lines of the one in force in Ontario. He states that taxes would probably be assessed as follows:

On asbestos mines 4 per cent on profits up to $500,000; 5 per cent on profits from $500,000 to $1,000,000; 6 per cent on profits from $1,000,000 to $5,000,000; and 8 per cent on profits above $5,000,000.

On gold, silver and other metal mines taxes will be 3 per cent on profits up to $1,000,000, with an allowance of $10,000 which will not be taxed; 4 per cent on profits from $1,000,000 to $5,000,00; 5 per cent on profits from $5,000,000 to $10,000,000; and 6 per cent on profits over $10,000,000.

In explaining the higher taxation on asbestos mines, the Minister said that these companies had been established in Quebec for about forty years and had their business in good condition and had markets for their product. Silver, zinc and other mines were just getting established, and the Minister thought that taxes should be lower. At the present time the Quebec tax is a levy on the gross value of the product, but when the new tax comes into effect it will be on profits only. It is believed that this action on the part of the government will do a great deal to stimulate mining activity in the province.

Discovery of Large Gold Deposits Reported from Iceland

According to the Swiss *Press Telegraph* what appears to be an important gold deposit has been discovered in the south of Iceland, near the town of Reikjavik, by German and English geologists. Of the assays made some of them showed up to 300 gm. of gold per ton; and the average was between 18 and 20 gm. According to the above-quoted source, a company for the exploitation of this deposit has been formed at Amsterdam, in which Dutch, German, and Swiss capital is interested.

News from Washington

By PAUL WOOTON
Special Correspondent

Congress Will Scrutinize Manganese Tariff

Present Duties Have Stimulated Domestic Production of Ores

THOUGH the duties on manganese are admitted to have had an important bearing on the increased domestic production from manganiferous iron ore, there is little question that the schedules applying to manganese will be among the first to come under scrutiny when Congress opens up the tariff bill for adjustments. The various classifications into which imported manganese fall are indicated by the following table:

Item	Paragraph	Class of Material	Duty
		Ore	
1	1,597	Manganiferous iron ore	Free
2	1,619	Other manganese ore, crude, not ground, refined, or otherwise advanced, and not over 30 per cent manganese content	Free
3	302	Manganese ore of over 30 per cent manganese content	1c. per pound of manganese content
		Concentrate	
4	214	Manganese concentrate, not over 30 per cent manganese content	30 per cent ad valorem
5	302	Manganese concentrate, over 30 per cent manganese content	1c. per pound of manganese content
		Manganese Iron Alloys	
6	301	Spiegeleisen (contains less than 30 per cent manganese), over 1 per cent carbon	75c. per ton
7	302	Spiegeleisen, not over 1 per cent carbon	1½c. per pound of manganese content, plus 15 per cent ad valorem
8	302	Ferromanganese (contains 30 per cent or more manganese), over 1 per cent carbon	1½c. per pound of manganese content
9	302	Ferromanganese, not over 1 per cent carbon	1½c. per pound of manganese content, plus 15 per cent ad valorem
		Other Manganese Alloys	
10	302	Manganese metal, manganese silicon, manganese boron	1½c. per pound of manganese content, plus 15 per cent ad valorem
11	302	Other manganese alloys for steel manufacture	25 per cent ad valorem
12	304	Manganese alloys substitute in tools	About 20 per cent ad valorem varying with value
13	1562	Manganese alloys, unwrought n.s.p.f.	Free
		Chemicals	
14	51	Compounds and salts, n.s.p.f.	25 per cent ad valorem

Item 1—Referring to Item 1 in the accompanying table it may be said that the U. S. Geological Survey considers as manganiferous iron ore ore running less than 10 per cent in manganese. This is regarded as a rather arbitrary division, but recent investigations have shown that it covers the reserves of this material in the United States. It is assumed that it also would cover ore of this character produced in foreign countries.

Item 2—The tariff act of 1922 does not provide specifically for manganese ores of less than 30 per cent of manganese content. It can be grouped, however, under paragraph 1619 with other crude ores. Many manganese ores not considered generally as iron ores carry from 10 to 35 per cent manganese. The average in the United States is 16 per cent. As these ores are almost invariably ferruginous they can be entered for import as manganiferous iron ores, or as ferruginous manganese ores. In either event they would come in free.

Item 3—Most ores of this class carry from 45 to 52 per cent manganese. The specific duty is equivalent to about 50 per cent ad valorem.

Item 4—Duty on concentrates depends upon the manganese content.

Item 5—Products under this classification are practically with those of Item 3, as the manganese content of the concentrates probably would not be greater than that of the best crude ore.

Item 6—Spiegeleisen contains about 20 per cent manganese. If the specific rate were translated into an ad valorem duty it would be 1 to 1⅛ per cent.

Item 7—This commodity is a product of the electric metallurgical furnace. It is comparatively rare in commerce. Translated to an ad valorem basis the total duty would be from 35 to 50 per cent.

Item 8—Calculated on an ad valorem basis this product would be dutiable at the rate of 35 per cent.

Item 9—This commodity is a product of the electro-metallurgical furnace. It is used for special purposes. The calculated ad valorem duty would not be more than 50 per cent.

The other items in the schedule need no special discussion.

The explanation of the fact that general imports of manganese ore are overwhelmingly greater than the imports for consumption apparently is that either large stocks are being accumulated or ore primarily classified as dutiable later is declared to be non-dutiable and is withdrawn from warehouses as non-dutiable. Such a change in classification during storage means that the material is found to contain less than 30 per cent manganese.

Couzens Committee Testimony Fails to Reveal True Situation

Mine Valuations Defended by American Mining Congress—Would Decide Cases on Merit

Mining interests have been hard hit by the secret testimony taken by the Couzens Committee investigating the Internal Revenue Bureau. According to disclosures, recently made public, it has been made to appear by the committee that the mining industry has escaped proper taxation through over-valuations. Secretary of the Treasury Mellon has defended the action of the department in applying the valuations fixed by the preceding administration on the silver- and copper-mining companies.

The American Mining Congress has issued a statement declaring that the testimony of the Senate committee which assails the valuations allowed the silver and copper companies does not reflect the facts, but on the contrary fails to disclose the real issues. The statement says: "Valuation factors selected by the government in 1918 over objections of copper companies were accepted by them in good faith, as their representatives felt that difficulties, delays, and litigation would be avoided by immediate settlements of tax liability, which would enable the industry to proceed without interruption or uncertainty which might be involved in extended controversy with the Treasury over basic valuations."

This position appears to have been justified from the statement of Secretary Mellon that the valuations were "made by competent authorities" and that the copper companies "considered their taxes for 1917 and 1918 closed." The secretary further says that to reopen these cases now would upset the industry.

When the mining industry learned in 1922 of an effort to revalue the properties of the copper-mining companies, protest was made on the ground that it might permit arbitrary consideration of all variable factors involved, which it was feared would be subject to differences of opinion and conflicting judgments of engineers, appraisers, owners, lessees, buyers, and operators as to future operating profits, mining costs, average prices, risk and discount rates, available tonnage, present worth, plant requirements and replacements, and grades of minerals.

It is understood that the decision of the department to revalue the copper mining companies was based on the discovery of errors in the original valuations, which are now classed by it as "provisional," subject to revision.

The mining congress in further protest of revaluing these properties and reopening tax cases of past years, says: "The matters sought to be corrected are questions of judgment, in which elements of doubt may be decided arbitrarily in favor of either the government or the mining companies. In relation to such matters there has been no convincing evidence of gross error in the basic valuations of the copper mining companies."

It has also developed that as a result

of the Senate inquiry the Treasury has decided to revalue silver-mining companies on a similar basis. In this instance, the mining congress opposes the arbitrary imposition of a blanket revaluation on the ground that the silver-mining companies have not been given a hearing, and has assumed that their tax liability had been previously determined. "If the department had taken individual cases in an effort to adjust errors, and decided each on its merits, there would be no objection from the mining industry, but to arbitrarily impose a blanket revaluation plan upon the silver and copper industries, without opportunity to be heard, is an unjust and indefensible step, which we believe taxpayers generally will condemn," the American Mining Congress said.

Western Australia Takes Steps to Revive Gold Mining

Taxes of Successful Prospectors Lowered—Production to Date Totals £152,193,798

The Western Australian Parliament has decided to relieve from taxation those who might go prospecting if they made a mining find. If an individual or a company invested £20,000 in a gold mine in that state he was often taxed on £5,000 received from the venture as if it were a profit, whereas the mine had only returned a quarter of the capital invested in it. This injustice has now been rectified. The Commonwealth Ministry has agreed to encourage the mining industry by relieving it of direct taxation.

In the opinion of D. L. Doolette, a well-known mining man of Perth, Western Australia, as expressed when he was speaking of mining activities in that state, the best prospects of success are to be found at Wiluna and Ejudina. At Wiluna the lodes are large, but they contain antimony, and it is for that reason that they have been neglected for some years. It is alleged that the ore can now be successfully treated by flotation. Mr. Doolette says that bore holes were put down to 600 ft. on the Gwalia Consolidated, in which the London Lake Ivanhoe Co. is interested. It is understood that values in the bores ranged from £1 to £32 a ton. Shafts are to be sunk to test the bore-hole results. The Wiluna field formations are large, and for that reason developments are being watched with much interest. At Ejudina a group of six mines has been brought under one control; the title of the new concern is Ejudina Gold-Mining Co. It is said that some of the government expert officers of Western Australia consider that good prospects exist at this center.

The production of gold in Western Australia for 1924 was 485,035 oz., valued at £2,000,028, compared with 504,511 oz., valued at £2,143,028, for the preceding twelve months, the figures for the latter term, again, being considerably less than those for 1922. Thus, the yield from the leading gold-producing state of Australia is still on the down grade, and more than three-fourths of the output is from the few remaining mines of Kalgoorlie. The search, too, for new mines to take the place of those being worked out on that field has thus far failed. Apart from Kalgoorlie and the three or four smaller centers, the combined monthly return from the gold fields of the state totals only a few thousand ounces. Western Australian production of gold to date amounts to 36,394,045 oz., valued at £152,193,798.

London Letter

By W. A. Doman
Special Correspondent

Ashanti Pays 6d. Dividend, Making 25 per Cent for Year

New Treatment Apparently Successful —Recent Find in Zinc Corporation's Mine Will Lengthen Life

London, March 3—The Ashanti Goldfields Corporation has declared a final dividend of 6d. per share, making 1s. per share, or 25 per cent for the past year. It is assumed, in consideration of the fact that the company made no distribution for two years, that the reorganization of the treatment plant has proved a success. The ore is now treated by the dry-crushing and roasting process. The annual report is expected to appear within a week, and not only shareholders but also the mining profession are awaiting it with much interest.

An important strike has been made on the 9th level of the South Blocks mine, belonging to the Zinc Corporation (N.S.W.) The width of the orebody is 120 ft., and it assays 8 oz. silver, 14½ per cent lead, and 20 per cent zinc to the ton. The mine produces about 4,000 tons of lead and 2,500 tons of zinc concentrates monthly, and this fine strike will lengthen its life.

Five years ago an Imperial Mineral Resources Bureau was constituted to keep the government informed of where and in what quantities various minerals were to be obtained within the British Empire. In the last two or three years there has been some disagreement between this bureau and the Imperial Institute. The mining engineers connected with the bureau have resented the treatment they have received at the hands of the Imperial Institute, the latter having made endeavors to take over the work of the Bureau. It has been largely a question of cost, and the idea is for the officials connected with the Institute to retain their positions and emoluments. A position has now arisen in which a bill is being introduced for an amalgamation of the two undertakings, the bureau sinking its identity. The latter has rendered valuable services, and its statistical information was of the greatest value.

Though Kafir shares in general are out of favor, owing to the wage demands of white miners and the resistance opposed to them by the Chamber of Mines, shares of companies on whose areas platinum has been discovered, or may be discovered (!), are holding the field. In fact, the movement seems to have overreached itself, as no extraction, and consequently no treatment has yet taken place. The suggestion is that Johannesburg speculators have rushed up prices, and are hoping to unload on this side.

A little while ago I mentioned that W. Bleloch's theory that the reef of the Boksburg gap could be profitably worked had been confirmed by a government mining engineer. This gentleman was Mr. Munnik, and it is now being pointed out that he no longer occupies an official position. His experience would tell, whether he were an official or not, but it is strange that independent authorities still disbelieve in the payability of the area.

Johannesburg Letter

By John Watson
Special Correspondent

Jackhammer Drills Cut Labor Costs in Rand Mines

Gold Standard To Be Resumed on July 1—Rhodesia Likely To Follow

Johannesburg, Jan. 27.—The increased efficiency in rock breaking by the use of jackhammer drills was shown by Sir Evelyn Wallers in a memorandum read to the Mines Conciliation Board on Jan. 13. A chart showed that in January, 1923, a total of 16,620 machine-shifts were worked on the Crown Mines to break 11,282 fathoms; 14,114 fathoms were broken in November, 1924, in 7,823 machine-shifts. There was also a decrease in colored labor from 1,678 to 993. This was given as a typical instance of improved efficiency with the increasd use of jackhammers, together with improved methods.

The Union Minister of Finance announced, on Jan. 12, the government's decision to return to the gold standard, on and from July 1. A government commission has recently reported in favor of the early resumption of gold payments. These authorities, in a long report, say absolute stability cannot be claimed for the value of gold; but it is incomparably more stable than paper. The vice-chairman of the Rhodesia Chamber of Mines, recently interviewed on the subject, expressed the opinion that Rhodesia will probably follow the lead of the Union and return to the gold standard about July 1.

The Luka gold field, in Nyasaland, is arousing interest, in spite of its inaccessibility, says the *Nyasaland Times*. It is situated about 100 miles from the north end of Lake Nyasa, or 320 miles from the Dar-es-Salaam to Kegonia railway. The Luka is, therefore, not a poor man's gold field. Those familiar with conditions consider that a prospector needs fully £200 to enable him to make a safe start. The areas so far developed are small and limited. Government returns show about £15,000 value of gold won by twenty or thirty claim holders. Every claim holder has from twenty to one hundred "boys." Labor is plentiful, but extremely difficult to control and manage, and truculent.

Men You Should Know About

Charles A. Mitke is on a professional visit to the United Verde Extension Mining Co., at Jerome, Ariz.

Lewis Buckley was elected chairman of the Engineering Foundation at the tenth annual meeting of that body.

W. D. Thornton, in company with **Dr. L. D. Ricketts,** has been spending a week at the Inspiration Consolidated Copper Co., at Inspiration, Ariz.

J. H. Lang, of the American Metal Co., Ltd., left on Feb. 25 for Miami, Fla., where he expects to remain for several weeks to regain his health.

Allan J. Clark, metallurgist of the Homestate Mining Co., has gone to Los Angeles for two months, to recuperate after a period of illness.

C. F. Kelley, president of the Anaconda Copper Mining Co., and **H. C. Bellinger,** vice-president returned to New York from South America last week.

Philip R. Bradley, consulting engineer for the Alaska Juneau Gold Mining Co., was recently in Los Angeles en route from Arizona to San Francisco.

D. H. Fairchild, of Fairchild & Fairchild, consulting engineers, of Chicago, is making a professional trip through Mexico, Arizona and various points in the Southwest.

J. A. Dresser, of Montreal, is visiting the Pacific Coast in his capacity as consulting geologist for the Canadian Pacific Ry. Co. At present he is in Vancouver.

E. V. Daveler has been appointed general manager for the Butte & Superior Mining Co., to succeed **Charles Bocking.** Mr. Daveler has been general superintendent since 1920.

R. L. Chase, of Los Angeles, has taken an option on the San Martin properties in the Uruachic district, locally known as the Watterson property, in Chihuahua, Mexico.

Charles E. van Barneveld, superintendent of the U. S. Bureau of Mines Station at St. Louis, Mo., is leaving the government service to engage in horticultural work in California.

T. Wolfson, president of the Metals Sales Corporation, an Anaconda subsidiary, is traveling in Europe. He expects to be away about two months, and is accompanied by Mrs. Wolfson.

W. B. Phelps, manager of the Tom Reed mine, at Oatman, Ariz., was a visitor to the new gold camp of Gilbert, and also made a short examination of the Tolicha district, south of Goldfield.

H. W. Edmondson, lessee of the Rio Plata Mining Co., in Chihuahua, Mexico, has returned from an examination of the Oro Grande district, New Mexico, accompanied by **A. H. Krieger,** of Los Angeles.

Fred A. Starky has returned to Nelson, B. C., Canada, after his visit to Wembley at the British Empire Exhibition as the representative of the Department of Mines of the Province of British Columbia.

John G. Barry, consulting mining geologist and engineer, until recently chief geologist of the American Smelting & Refining Co., announces that he is now engaged in private practice, at 612 Mills building, El Paso, Tex.

Charles Hayden of Hayden, Stone & Co. has left for a two months' vacation and yachting trip along the Mediterranean, visiting the northern coast of Africa, going up the Nile, then to Palestine, Bagdad, Constantinople, Athens, and Rome.

K. G. Frank, who has been United States representative for many years of important German coal and iron mines and metallurgical establishments, has just returned from Europe. Mr. Frank has long been instrumental in the exchange of information concerning technical development both in the United States and in Germany.

K. G. Frank

Milton H. McLean has resigned as superintendent of the United Verde Extension Mining Co., and will make his home in Santa Barbara, Calif. **G. W. Prince,** smelter superintendent, is acting assistant general manager, and **Richard D'Arcy,** chief engineer, is acting mine superintendent in the absence of Mr. Kingdon.

President C. H. Clapp and **Dean E. B. Norris** of the University of Montana; **H. H. Cochrane** and **Frank Scotten** of the Montana Power Co.; **W. N. Tanner,** of Anaconda, and **William A. O'Kelly,** of Butte, of the Anaconda Copper Mining Co., are among the engineers appointed as representatives of the Engineering Foundation, with national headquarters at New York.

Arthur Moore, who has had a long experience in boring for artesian water and in oil prospecting in Queensland, and who was at one time in charge of the government oil bore at Roma in that state, has been appointed head driller to the New Guinea Oil Company, Ltd., and left Australia for that territory in January. Mr. Moore, after the closing of the Roma bore, went to America to bring his oil-boring knowledge up to date, and was in the service of the Chanslor-Canfield Midway Oil Co., of British Columbia.

C. Q. Schlereth has resigned as general manager of the El Potosi Mining Co, of Chihuahua, Mexico, and will open an office in New York City as consulting mining engineer. He has been succeeded by **E. P. Ryan. C. J. Pinson** has resigned as mine superintendent of the above-named company, and **H. A. Walker,** assistant superintendent, has taken Mr. Pinson's position as superintendent.

W. P. Hammon, president of the Yuba Consolidated Goldfields Co. and interested in other California operations, was in Colorado recently in connection with his interests in the South Park Dredging Co., which is operating in Park County near Fairplay, Colo. With a favorable adjustment of conditions affecting operations, it is reported that the company contemplates the installation of a second and larger dredge.

Obituary

Bertrand Marsch, a pioneer of the Yukon, where he went in the gold rush of 1898, died in Dawson on March 3, at the age of sixty-four, as the result of an accident two years ago, when he was seriously burned by falling into boiling water when engaged in thawing out frozen ground. He was a native of Luxemburg.

William E. Bennett, mining engineer, died in Toronto, on March 10, at the age of forty-nine. He was born in England and had an extensive mining experience in South Africa, where he was in charge of the Kimberley Reef for several years. He was afterward in charge of a mine in Sweden, and when operations were interrupted by the war returned to England and engaged in war work. Mr. Bennett came to Canada after the armistice and was for some years on the staff of the O'Brien mine, of Cobalt, and recently with the Noranda Mines of Rouyn. He was well known in northern Ontario and was a member of the American Institute of Mining and Metallurgical Engineers.

James Cronin, pioneer mining engineer and prospector of the American Northwest, died at his home at Spokane on March 3, aged seventy-two. Cronin began his career in the Comstock mine, at Virginia City, Nevada, in 1878. He has managed mines in Nevada, California, and Idaho. In the early 90's he came to the Kootenays, where he staked the Eugene mine, at Moyie, which became one of the largest producers of silver and lead in the Kootenays. He managed other properties in the Kootenays, and then turned his attention to the country opened up by the Grand Trunk Pacific Ry. His last venture was the Babine Bonanza, in the Babine range. He had expected to organize a company to take this property over during the present winter, but his sickness intervened. Cronin essentially was a pioneer; having discovered a property and developed it to the examination stage he was content to let others operate it; he preferred hunting for mines to operating them.

Societies, Addresses, and Reports

Treasury Department to Revalue Copper Companies for Re-taxing

Seeks to Determine Anew Liabilities for 1919 and Subsequent Years—Mining Congress Protests

REFERENCE is made to the commissioner's order of Dec. 11, 1922, authorizing the Income Tax Unit to proceed with the revaluation of copper mining companies for the purpose of determining their tax liabilities for 1919 and subsequent years.

The Income Tax Unit is now proceeding with the work of revaluation of copper mining companies under an order of the Commissioner of Internal Revenue, according to information sent the American Mining Congress by some of the companies involved. At least one company has appealed. Others are in a quandary and have not yet decided on the course they should follow.

"The valuation factors selected by the government's experts and engineers in 1918, over objections of copper-mining companies," says the Mining Congress in a letter to the commissioner, "were finally accepted by the companies in good faith, in order that difficulties, delays and perhaps litigation might be avoided and the copper industry proceed without interruptions or added uncertainties that prolonged controversies with the Treasury Department over basic valuations would entail.

"The copper-mining companies, after finally agreeing to the major factors entering into their valuations for depletion purposes, proceeded to transact business, curtail operations, expend cash reserves for development, and, in many cases, to absorb losses occasioned by the depression in the copper industry since the war. Losses during four years of depression, expenditures to improve plant facilities and for development work, and expenses incident to the maintenance of the mining properties while idle or operating on a part-time or curtailed basis, have left the copper companies without funds for payment of unanticipated increases in tax liability in the manner proposed.

"It is not to be expected and it is not proposed by any one that the department should undertake to reduce the lawful tax liabilities of copper companies, or any other class of taxpayers, because of such considerations as are here outlined. Such action would be neither constitutional nor equitable. Each industry should pay its lawful and just share of the tax burden. And this observation leads us to the crux of this matter of revaluation—viz., that unless the department has grossly erred in the computation of the tax liabilities of copper companies or unless fraud has been found in the tax adjustments for the years involved in the revaluation order of Dec. 11, 1922, there is no just or legal ground for reopening the original valuations and other questions in these copper cases.

"The commissioner is cognizant of the issues embodied in the recommendations of the Income Tax Unit, which were approved Dec. 11, 1922. The unlimited authority granted by that order and the alleged 'causes' enumerated in those recommendations, for the reopening of all copper cases, were carefully considered and fully understood. Yet, it is very difficult to believe that the issues were fairly presented, inasmuch as the recommendations were not disclosed to the copper-mining companies until in 1923, several months after the revaluation order was promulgated, and nearly one year after the recommendations were made; and we also find it difficult to believe that these recommendations would have been approved if they had been made public and the copper companies given an opportunity to be heard.

"On June 22, 1922, we learned that a hearing on the question of revaluation would be held on June 30, 1922, and we very hastily notified a number of the copper companies having offices in New York, Boston, and Michigan. Representatives of these companies came to the hearing of June 30 almost wholly unprepared. Many of them had received final letters and final assessments, and, in some cases, had received refunds. Neither we nor they were apprised of all the issues involved. We did not have before us the recommendations of the Income Tax Unit, and the hearing of June 30, 1922, therefore was not only not representative but was incomplete in that only a single issue, that of the price factor used by the government in determining values and future expected profits, was considered in detail. During this hearing Messrs. Albert H. Fay and Orr Hamilton, who were present as representatives of the Natural Resources Division of the Unit, were silent. The companies, with perhaps one exception, were wholly unprepared and without more than a smattering of information as to what the proceeding was all about.

"In cases in which revaluations have been made, the department's engineers may change arbitrarily all variable factors entering into or involved in the valuations of copper-mining companies which may be subject to wide differences of opinion and conflicting judgments of qualified engineers, appraisers, owners, lessees, buyers, and operators, such as estimated future operating profits, mining costs, average prices, risk rates, discount rates, available tonnage, present worth, plant requirements, plant replacements, grades of minerals, and, in fact, every factor once finally determined by experts of the Income Tax Unit, and subsequently relied upon by the copper-mining companies in the management and conduct of their affairs. There has been no convincing evidence of gross error in the basic valuations of the copper-mining companies. Competent engineers, both in and out of the department, and having no direct or indirect interest in the present revaluation proceedings, are not in accord on the accuracy of all factors. Therefore, the doubt should be resolved in favor of the taxpayers and the proceedings discontinued.

"The American Mining Congress requests the commissioner carefully to consider the manner in which the Income Tax Unit is exercising discretionary power and arbitrarily creating additional tax liability for prior years not anticipated or provided for by the copper companies, and also to the ability of the copper companies to borrow money or liquidate under existing conditions in order to pay such arbitrarily created and retroactively assessed additional tax liability.

"The copper-mining companies submitted in good faith valuation data in accordance with the requirements of the law and regulations. In 1919 the experts of the Income Tax Unit recommended certain factors upon which to base valuations of mining properties which were approved by the then commissioner. The basic valuations of copper mining companies thereupon were made by the Income Tax Unit, and the companies thereafter, relying upon the good faith of the department and acting in good faith, proceeded with financial and business transactions and readjustments which have been consummated irrevocably. Revaluation, retroactively applied, will bring about disastrous consequences in many instances, and even if applied only for future years will impose hardships upon the copper-mining industry that will seriously interfere with its future development and recovery from depression caused by subnormal domestic conditions and foreign cheap copper production now entering the world's markets.

"It is respectfully submitted that the facts justify the immediate revocation of the said order of Dec. 11, 1922."

Geological Field Course in Lake Superior Region

The summer course in geological field work which has been given in the Lake Superior region for the last six years by the department of geology of Northwestern University will be repeated this year, beginning about Aug. 13 and ending about Sept. 10. It will be devoted largely to a study of the Pre-Cambrian geology of parts of the Lake Superior area, especially northeastern Minnesota and adjacent portions of Ontario. It is expected that the route of travel for 1925 will be approximately the same, but it may be varied somewhat to afford opportunity to study additional localities. A day will be spent at the head of Lake Superior, where interesting formations will be seen. The Mesabi and Vermilion ranges will be visited. Camps will be established at various points along the route. Prof. U. S. Grant will be the instructor in charge. Correspondence should be addressed to him at University Hall, Evanston, Ill.

Recent Technical Publications

Reviews, Abstracts, and References

Almost every day we have inquiries as to when the new book containing a revision of all the marketing articles that have appeared in *Mining Journal-Press* will be published. The McGraw-Hill Book Co. promises that it will be out by the time this appears in print.

Moving pictures are a great educational medium, and the one who writes the subtitles for the Pathé News Weekly is overlooking no opportunities to make scientific terminology familiar and pronounceable. There is little danger of New York City being seriously shaken by an earthquake, he says in a current release, because the city is built on a solid bed of "gnice."

Dick Wick Hall, who amused our readers by his more or less scholarly report on the Arizona Apache mine in our Nov. 15 issue, is getting to be quite a literary light, with his frequent appearances in the *Saturday Evening Post*. We were delighted with "Who's Loony?" in the Feb. 28 issue. For example: "That's Just What Most Mining Claims and Mining Men is—Mostly Buts and If and Maybes and no Paystreak and not enough Horse Sense to quit and go to Work. Any 10 year old Boy would have better sense than to Pour water in a Squirrel Hole for 18 Years if no squirrel come out." Hall promises to be the Ring Lardner of the Southwest, with a little of George Ade thrown in. He has evidently found quite a gold mine, but strangely enough it is in Philadelphia. We hope he will not forget *Mining Journal-Press* entirely, even if the honorariums may not be quite so generous as Brother Curtis supplies.

The 1925 Skinner

The Mining Manual and Mining Year Book, 1925. By Walter E. Skinner. Published by Walter E. Skinner, 15, Dowgate Hill, London, E. C. 4, England. Price, post free abroad, 21s. 6d.

Since the death of Walter R. Skinner, his son, Walter E., has taken over the editing and publishing of this useful handbook. No changes have been made in the manner of treatment or the appearance of the book, and it remains a valuable guide to the personnel, organization, financing, and operation of most of the world's important mines. The data are up to date and the book is always published promptly.

The present edition is said to contain full particulars of 1,483 mining companies in its 864 pages, as well as lists of engineers and directors, share statistics, and data of operation. It is difficult for one in the United States to understand why some companies are not included when some that are mere prospects are given space. Even in Canada, which one would expect to be covered properly in a British book, no mention is made of dividend-payers such as Silversmith or the Asbestos Corporation; nor of Teck-Hughes, nor a big prospect like the Noranda. In the United States, big companies like St. Joseph Lead, Mother Lode Coalition, and the American Metal Co. are omitted entirely, as are the Peñoles, Amparo, and Ahumada companies in Mexico, and the New York & Honduras Rosario and Cerro de Pasco further south. These are all substantial companies and dividend payers; they deserve to be included in any book that makes any pretension to covering the important mining companies of the world.

E. H. ROBIE.

Geochemistry—The fifth edition of Frank Wigglesworth Clarke's book, "The Data of Geochemistry," has recently been published as Bulletin 770 by the U. S. Geological Survey, Washington, D. C., 841 pages. It is obtainable free from the Survey so long as its supply lasts; thereafter for $1 from the Superintendent of Documents, Washington. The subjects of the various chapters include: The chemical elements; the atmosphere; lakes and rivers; the ocean; the waters of closed basins; mineral wells and springs; saline residues; volcanic gases and sublimates; the molten magma; rock-forming minerals; igneous rocks; the decomposition of rocks; sedimentary and detrital rocks; metamorphic rocks; metallic ores; the natural hydrocarbons; and coal. This is one of the most important books ever issued by the Survey and deserves a place in the library of every engineer at all interested in the formation and composition of the world on which we live.

Ore Dressing—A revised copy of "The Status of Research in Ore Dressing," by Ernest A. Hersam, has been issued by the U. S. Bureau of Mines, Washington, D. C. as *Reports of Investigations*, Serial No. 2,669, 48 pages, obtainable on request. The report covers the main features of ore-dressing practice on this continent and points out the most attractive fields for improvements. Much of the matter is the same as was published in the first bulletin issued a year ago.

Grinding Costs — "Crushing .and Grinding Costs" was the title of a four-page article by Tyler Fuwa in *Chemical & Metallurgical Engineering* for Aug. 18, 1924, giving original and operating costs on various types of machines for certain kinds of work, with several graphs comparing cost and capacity. (New York; price 25c.)

Mineral Resources—Recent separate chapters of "Mineral Resources of the United States, 1923," obtainable on request from the U. S. Geological Survey, Washington, D. C., include: "Antimony," 16 pages, by Frank C. Schrader; "Abrasive Materials," 10 pages, by Frank J. Katz; "Asbestos," 11 pages, by Edward Sampson; "Gold, Silver, Copper, Lead, and Zinc in Idaho and Washington," 42 pages, by C. N. Gerry; "Gold, Silver, Copper, and Lead in California and Oregon," 44 pages, by James M. Hill; and "Coke and Byproducts in 1922," 128 pages, by F. G. Tryon.

Patents

Ore Feeder—No. 1,521,820. Jan. 6, 1925. R. L. Lloyd, New York City, assignor to Dwight & Lloyd Metallurgical Co., New York. Design of an ore-distributing mechanism for charge cars.

Radium—No. 1,522,040. Jan. 6, 1925. K. B. Thews, Denver, assignor to W. A. J. Bell, Denver. Radium is extracted from carnotite ores by treating the finely ground ore with hot hydrochloric acid and drawing off and filtering the liquid solution containing the rare metals before precipitation of radium-barium sulphate begins.

No. 1,526,944. Feb. 17, 1925. K. B. Thews, Denver, assignor to W. A. J. Bell, Denver. By this process, oxalic acid is used for dissolving the rare metals, the solution afterward being separated from the undissolved carnotite ore.

Potash—No. 1,522,091. Jan. 6, 1925. C. M. Alexander, Waxahachie, Tex. A process of decomposing potassium-bearing minerals, comprising injecting pulverized mineral, fuel, and air into a combustion and reaction chamber, the design of which is suggested in the patent.

Fume Precipitation—No. 1,522,141. Jan. 6, 1925. R. B. Rathbun, Salt Lake City, Utah, assignor to American Smelting & Refining Co., New York. A process of applying an acid mist to the surface of an electrode used for fume precipitation so that the collection of non-conducting dust will not impair the conductivity of the metallic electrode surface.

Classifier—No. 1,522,151. Jan. 6, 1925. A. H. Stebbins, Los Angeles. Design of a pneumatic classifier.

Magnetic Separator—No. 1,522,343. Jan. 6, 1925. Clarence Thom, Wallace, Idaho. Device for the magnetic separation of the minerals in an ore pulp.

No. 1,527,069. Feb. 17, 1925. Orrin B. Peck Jr., Los Angeles. A process and device for separating the magnetic from the non-magnetic particles in a liquid pulp by combined magnetic and centrifugal means. Patents Nos. 1,527,-070 and 1,527,071, issued to the same applicant, cover different types of magnetic separators.

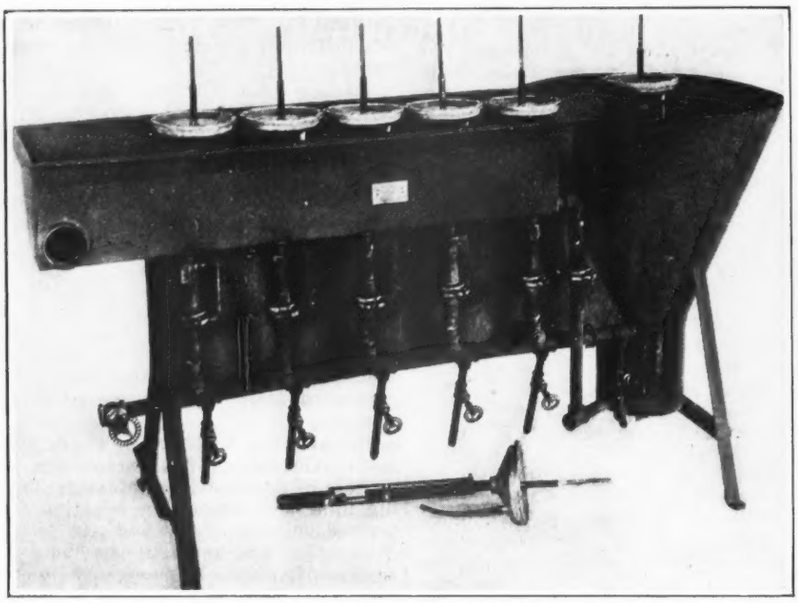
Grinding Mill—No. 1,522,407. Jan. 6, 1925. Raymond Barkhurst, Portland, Ore. A grinding mill of the Chilean type except that large steel balls are used for grinding, rolling in two races, one above the other, near the periphery of the mill.

Flotation — No. 1,521,277. Dec. 30, 1924. N. C. Christensen, Salt Lake City, Utah. A flotation of the so-called mechanical type, the froth being produced by a smooth, rotating cylinder, dipping slightly below the pulp level.

No. 1,526,997. Feb. 17, 1925. E. B. Malmros, Lynbrook, N. Y. A pneumatic flotation machine, with sloping sides and vertical baffles projecting above each side of the air cell, so that a free area is provided for the downward movement of the pulp.

Crusher—No. 1,524,675. Feb. 3, 1925. E. B. Smith, Marion, Ind., assignor to Marion Machine, Foundry & Supply Co., Marion, Ind. Design for a toothed roll crusher.

New Machinery and Inventions



Fahrenwald constant-density classifier

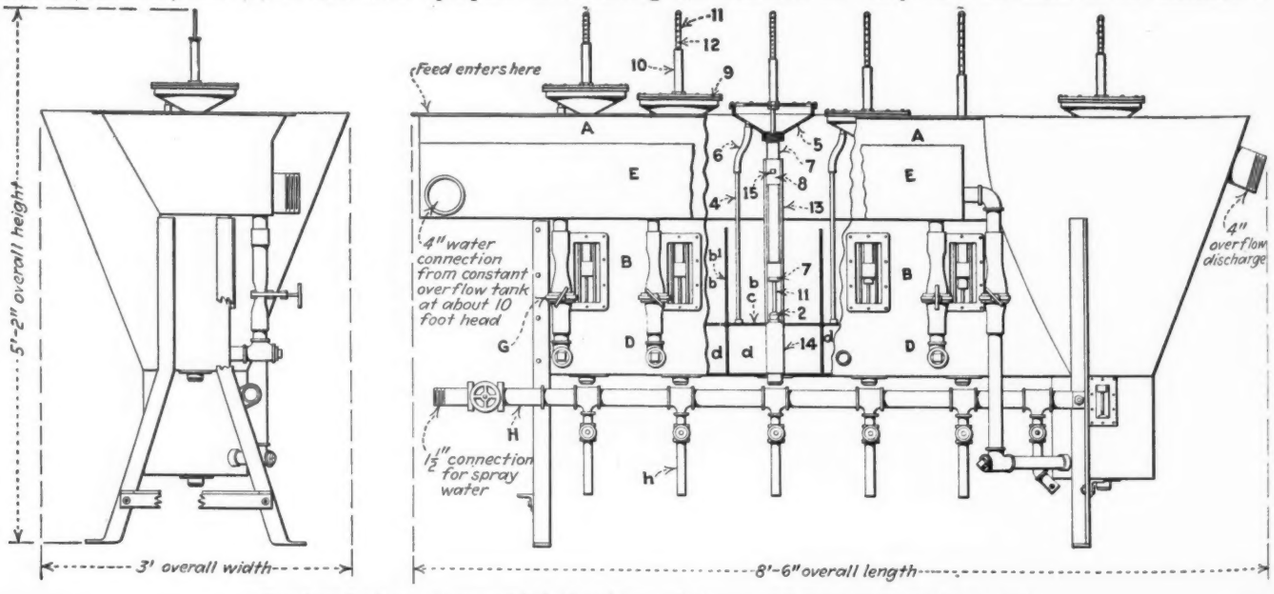
New Classifier Solves Problems, Manufacturer Claims

Has Been Widely Adopted in Mills of Coeur d'Alene District, Idaho

The Fahrenwald classifier is the invention of A. W. Fahrenwald, ore-dressing engineer, of Moscow, Idaho, and is the result of experimentation by the inventor at the University of Idaho in co-operation with the State School of Mines. Practical tests were made in the Bunker Hill & Sullivan mill at Kellogg, Idaho. The development of the classifier involved the solution of three problems: (1) To determine the conditions or fundamentals of hindered settling classification; (2) the development of a hindered classifier embodying these conditions; and (3) to determine the efficiencies of tables working on such classified products. That the classifier embodies the successful solution of these problems is indicated by its adoption by practically all the mills in the Coeur d'Alene district, in Idaho. The Coeur d'Alene Hardware & Foundry Co., Wallace, Idaho, are the makers and distributors. It is claimed that the machine gives a classification which results in improved table work.

Referring to the drawing, the settling chamber *A* is V-shaped over the first five pockets and conical over the sixth pocket, and is provided with an overflow weir near the discharge end. The classifying section *B* is divided into the desired number of classifying pockets *b*. In one side of each pocket is a glass window for the purpose of observing the condition of classification. The constriction plate *C* is a perforated iron partition between the classifying section and the hydraulic pressure section. The hydraulic pressure section *D* is a continuation of the classifying section. Each classifying pocket *b*, with its portion of the constriction plate, and its pressure compartment *d*, forms an independent unit separated by water-tight joints from the adjacent units. In the bottom of each pressure compartment is a small hole to admit a stream of clean water for the removal of any sand that might pass through the perforations in the constriction plate. The discharge pipes (14) for the classified sands pass through the respective pressure compartments *d*. The hydraulic header *E* is formed on the outside of the settling chamber *A*, and branching from it are pipes and valves, one to each pressure compartment. The amount of water admitted to each compartment is regulated by individual valves, and when once adjusted requires no further attention. Constant density or discharge devices are complete, individual, and easily removed. Each consists of a discharge and supporting pipe (14) and sleeve (8), spaced apart and attached by bars (13). Mounted so as to slide in sleeve (8) is pipe (7), which terminates a few inches above pipe (14), which is held at the desired vertical height by set or clamping screws (15). Secured to the upper end of pipe (7) is a dish-shaped diaphragm chamber (5). A thin rubber diaphragm (9) is secured to chamber (5) at the periphery and carries at the center the vertical pipe (10). A hard cast-iron bushing or valve seat fits into the upper end of pipe (14) and the hardened steel plug (2) opens and closes the opening in the bushing. Cone (2) is attached to a long stem (11) which passes up through pipe (7 and 10), and has an adjustment pin (12) which engages the upper end of pipe (10). The flexible water connection tube (6) communicates through pipe (4) with pressure compartment *d*.

To insure the best results it is necessary that the sands to be classified be



Sectional view of assembled classifier. Letters and numerals refer to text

dewatered as much as possible, providing a feed containing 75 or 80 per cent solids, or not less than 65 per cent solids. The standard classifier is designed to handle not less than 100 tons nor more than 300 tons in twenty-four hours, though other sizes are manufactured as required.

In starting the machine the valves are opened about 50 per cent. When the machine is filled and water is flowing over the weir, feed is admitted. Sands quickly accumulate in the pockets and by observation through the windows the water should be adjusted to give just "full teeter" to the sand bed and no more, which means just visible agitation of the sand-water mixture. This gives maximum density of the mixture and a condition of maximum hindered settling. In a short time production issues from the discharge spigots well graded and free from slimes.

Load Indicator for Transformers

A load-indicating device for distribution transformers which compensates for ambient temperature is a recent development of the General Electric Co. The need for such an instrument has long been felt by the distribution engineer, the company states, as up to this time there has been no practical way to keep reliably informed as to load conditions on distribution transformers. The device is to be known as the Type A thermotel, catalog No. 270,503. It is suitable for use on a wide range of 60 cycle, pole-type, distribution transformers.

The instrument consists fundamentally of two thermometers connected in series. The first thermometer is actuated by the heat of the transformer's top oil; the second, located in the external case, by the ambient temperature and modifies the reading of the first.

The composite reading given by the hand closely approximates the internal coil or hot spot temperature and, for convenience, is given in terms of "per cent equivalent load." This is the percentage of the safe continuous output of the transformer, represented by the load cycle causing the indication.

The dial is calibrated from 50 to 125 per cent equivalent load, indicating either underloaded or overloaded transformers. A semaphore is tripped by the mechanism, and swings into view when the instrument registers more than 100 per cent equivalent load.

Readings in excess of 100 per cent show that the transformer is too small, since it has carried a continuous load, or a short-time overload equivalent to a continuous load, sufficient to bring the internal winding temperature (hot spot) to 100 deg. C. or more.

A resetting lever extends below the external case and, upon being reset, the instrument indicates the then existing load conditions on the transformer.

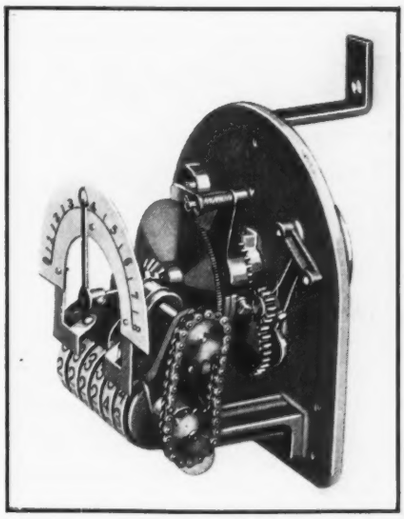
Other important features of this instrument are the ease with which it is installed, it being necessary only to lift the cover and slip the supporting arm over the edge of the tank, and the ambient correction which takes into account all variations in ambient temperature.

A Meter for Checking Coal Consumption

Twenty thousand dollars' worth of coal often passes under a single fire door each year; is it not worth checking? This inquiry is made in the catalog of the Republic Flow Meters Co. describing its meters for measuring coal. Coal is measured volumetrically by these meters. Equal volumes of coal have approximately equal weight, irrespective of the graded size, the company claims. Volumetric tests made prove that this is true, it states.

Coal recording meter in place

One of the accompanying cuts shows the meter in place measuring the coal at the point where it passes through the fire door; the other cut shows its interior mechanism.



Coal meter with case removed, revealing mechanism

Operation of the instrument depends on the automatic recording of the product of the cross-sectional area and the velocity of the layer of coal passing into the furnace, the meter therefore registering the volume of the coal burnt. The method by which this measurement is effected is as follows:

The meter is attached to the driving mechanism of the grate in such a way that the speed of a ratchet wheel is varied in proportion to the grate travel. At the maximum gate height, the counter makes a complete revolution with the ratchet wheel, turning off ten units. As the gate is lowered the motion is communicated to a cam which throws the two pawls out of contact with the ratchet wheel during a portion of a revolution, so that the number of units turned off by the counter is decreased in proportion to the amount by which the gate is lowered.

Thus for an 8 in. maximum gate the counter turns off ten units per revolution, at 4 in. gate height, five units per revolution and at 0 gate height the pawls are held from engaging the ratchet throughout a complete revolution, so that the reading of the meter is zero.

As explained before, if a number of equal volumes of any coal are weighed the variation in weight of the samples is extremely small, and therefore by multiplying the revolutions of the counting wheel by a suitable constant, a highly accurate indication of the weight of coal burnt will be obtained.

If coal is bought and accepted on weight at a given moisture content, the volumetric coal meter gives a more accurate record than any other means of arriving at the weight of coal consumed, as, the record being based on measurement of volume, all errors due to change of moisture in the coal are eliminated.

Three New Starters

Among the recent developments in industrial control are three new types of starter now being marketed by the General Electric Co. These are an inclosed magnetic switch for starting two- and three-phase alternating-current motors, and two types of automatic starter for synchronous motors, one for full-voltage starting and the other for reduced-voltage starting.

The inclosed magnetic switch bears the designation CR-7006-D9 and is for use with two- and three-phase alternating-current motors which can be thrown directly on the line in starting. This switch is also used to handle the primary circuit of a slip ring motor in conjunction with a secondary drum switch.

The new synchronous motor starters bear the numbers CR-7065 and CR-7061, for full and reduced voltage starting, respectively. Both starters are completely automatic and provide an easy and dependable means of starting synchronous motors. Special features are a temperature overload relay for close protection of the motor from overload, a definite time relay which determines the accelerating period during which the motor is connected to the compensator taps, and a field-controlling relay for closing the field contactor.

The Market Report

Daily Prices of Metals

Mar.	Copper N. Y. net refinery*	Tin		Lead		Zinc
	Electrolytic	99 Per Cent	Straits	N. Y.	St. L.	St. L.
12	14.20	53.375	54.125	9.00	8.70	7.35
13	14.20	53.625	54.375	9.00	8.70	7.40
14	14.20	53.375	54.125	9.00	8.70	7.375
16	14.15	52.625	53.375	9.00	8.70	7.35@7.40
17	14.125	52.375	53.00	9.00	8.65	7.30@7.35
18	14.00	52.375	53.00	9.00	8.625	7.25@7.30
Av.	14.146	52.958	53.667	9.00	8.679	7.350

*The prices correspond to the following quotations for copper delivered: March 12th to 14th, 14.45c.; 16th, 14.40c.; 17th, 14.375c.; 18th, 14.25c.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for deliveries constituting the major markets, reduced to the basis of New York cash, except where St. Louis is the normal basing point, or as otherwise noted. All prices are in cents per pound. Copper is commonly sold "delivered," which means that the seller pays the freight from the refinery to the buyer's destination.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for zinc are for ordinary Prime Western brands. Quotations for lead reflect prices obtained for common lead, and do not include grades on which a premium is asked.

The quotations are arrived at by a committee consisting of the market editors of *Mining Journal-Press* and a special representative of the Bureau of Mines and the Bureau of Foreign and Domestic Commerce.

London

Mar.	Copper			Tin		Lead		Zinc	
	Standard		Electro-lytic						
	Spot	3M		Spot	3M	Spot	3M	Spot	3M
12	63 3/8	64 1/2	68 1/4	246	249 1/2	36 15/16	35 5/8	35 3/4	34 15/16
13	63 5/8	64 3/4	68 1/2	249 1/4	252 3/4	37 7/16	36 1/4	35 7/8	35 5/16
16	63 1/4	64 3/8	68 1/4	245 3/4	249 1/4	37 1/2	36 1/4	35 3/4	35 1/8
17	62 7/8	64	68	241 1/2	245	37 1/4	35 7/8	35 5/16	34 5/8
18	62 1/2	63 5/8	67 1/2	240 3/4	244 1/2	36 7/8	35 1/2	35 1/4	34 1/2

The above table gives the closing quotations on the London Metal Exchange. All prices in pounds sterling per ton of 2,240 lb.

Silver, Gold, and Sterling Exchange

Mar.	Sterling Exchange "Checks"	Silver		Gold London	Mar.	Sterling Exchange "Checks"	Silver		Gold London
		New York	London				New York	London	
12	4.77 1/2	67 7/8	31 15/16	86s 7d	16	4.78 3/8	68	31 15/16	86s 4d
13	4.78 3/8	68	31 15/16	86s 4d	17	4.78	68 1/8	32 1/16	86s 7d
14	4.78 3/8	67 3/4	31 15/16	..	18	4.77 1/8	68	32 1/16	86s 8d

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London silver quotations are in pence per troy ounce of sterling silver, 925 fine. Sterling quotations represent the demand market in the forenoon. Cables command one-quarter of a cent premium.

Major Non-ferrous Metals Make Further Declines

New York, March 18, 1925—One producer characterized the last week the dullest in his experience. The reason for this inactivity is ascribed principally to the setback in the stock and grain markets and the easier feeling in some businesses. It has been a buyer's week in the metal markets.

Copper Falls to 14¼c.

Outside of one good sale in the Detroit district and only a small business in the Connecticut Valley, the market was quiet. Copper was bought at 14.50c. delivered on Thursday and Friday, but on Monday, with lower quotations from London, consumers became reluctant to place any tonnages at that price. On Tuesday a cut of one-eighth cent was made and a moderate amount of copper sold. Even this price did not hold for long, so that it was possible to obtain the metal from several directions at 14¼c. on Wednesday, with the prospect that even that quotation might be shaded. Some business which might have been placed earlier in the week if the market had held firm was scared away by the drop and will probably be taken up as soon as the market shows a stabler tendency. Although most producers report a poor foreign business, at least one important producer transacted sales in fair volume abroad, particularly in Germany. Quotations ranged between 14.65 and 14.525c. c.i.f. Reports from consumers indicate that the demand for finished products is holding up well. In Connecticut a leading copper and brass manufacturer reports a record-breaking run in the first two months of 1925, while in the Middle West an improved outlook on the part of some automobile manufacturers has brightened the situation. It is noticeable that speculative activity has been more pronounced in the copper market of late than normally.

Lead Slightly Easier

The contract price of New York lead, set by the American Smelting & Refining Co., continues at 9c.

The week ending today has been a quiet one in the lead market, though this metal has perhaps suffered less than any other in the violent reactions that have characterized most all markets in the last few days. Moderate tonnages have been sold for 9c., New York, all week, and apparently no producers are disposed to cut this price, despite rumors that slight concessions have been possible in the last two days. In the St. Louis market, on Thursday, Friday, and Saturday, all sellers were quoting 8.70c., but late Monday a dealer quoted 8.675c. and yesterday and today further slight shadings have been made, so that the current price is slightly lower than the freight differential between New York and St. Louis would indicate. Producers have shown a disposition to meet the dealers' and consumers' ideas of the market, though there is no great anxiety to press lead on an unwilling market, for they are pretty well sold up. However, with lead prices as high as they are, producers do not feel that it is wise to stock much of the metal.

A prominent consumer whose lead goes into varied channels used almost exactly the same amount of lead in January and February that he did in the same months of last year. This indicates that enlarged production and lessening stocks have been the reasons for the easier condition of the market, rather than diminished consumption. A year ago, considerable Mexican lead was coming into this country, but recently all or nearly all of this has gone abroad. At times, prices have been such that foreign ore lead might almost be sold here, but this has not been done to any extent. The dearth of Mexican lead has been offset by an increased domestic production, though no recent increases are noted. The crude lead production of the United States has held remarkable steady recently at about 47 000 tons per month.

Zinc Works Lower

In common with the other non-ferrous metals, zinc sales were poor. For a time it looked as if zinc was on its way upward, but after climbing to

7.40c. per lb. on Friday the market declined daily, working down to 7.25c. on Wednesday. Consumers do not seem interested in the market. In the absence of export business, domestic consumption becomes more important than it has been lately. Some European zinc, probably purchased originally from American producers, has been resold abroad, depressing prices over there and having an effect upon prices here. Brass Special was bought earlier in the week at a premium of about 7½ points over the price of Prime Western. A slight premium exists for prompt shipment zinc. The price of high-grade remains unchanged at 8¾c. delivered.

53c. Tin Attracts Buyers

The tin market was a quiet affair until yesterday, when some interest was aroused in consumers by a reduction in prices for all positions to 53c. A premium on forward deliveries has ruled in London, but sellers here have not been able to obtain it.

Silver Steady

The market continues steady with narrow price range and small amount of business. In London, spot and forward quotations have fluctuated only ⅛d. during the last week, although the spread has now included from ⅛d. to ¼d., which would indicate a relatively better outlook for spot silver abroad. In the local market price fluctuations have also been small, with forward silver offered at approximately the same discount below spot as in the London market. India continues a moderate buyer.

Mexican Dollars—March 12th, 52¼c.; 13th, 52⅜c.; 14th, 52¼c.; 16th, 52⅜c.; 17th, 52¼c.; 18th, 52⅜c.

Foreign Money Unchanged

Foreign exchanges are at substantially the same levels as last week. On Tuesday, March 17, closing cable quotations on francs were 5.175c., lire, 4.075c. and marks, 23.81c. Canadian dollars, 3/32 per cent discount.

Other Metals

Quotations cover large wholesale lots unless otherwise specified.

Aluminum—99 per cent grade, 28c. per lb.; 98 per cent, 27c. London, £125.

Antimony—
Chinese brands, 15¼@15¾c. per lb.
Cookson's "C" grade, 18@18⅜c.
Chinese needle, lump, nominal, 10c.
Standard powdered needle, 200 mesh, 11½@13c.
White oxide, Chinese, 99 per cent Sb_2O_3, 16@16½c.

Bismuth—$1.95 per lb., in ton lots. London, 7s. 6d.

Cadmium—60c. per lb. London, 2s. 2d.@2s. 6d.

Iridium—$325 per oz.

Nickel—Ingot, 31c.; shot, 32c.; electrolytic, 38c.; London, £170 per long ton.

Palladium—$79@$83 per oz. Crude, $60@$65.

Platinum—$117 per oz. for refined. Crude, $115.

Quicksilver — $81 per 75-lb. flask. Heavy purchases in Europe indicate advance in prices in United States is likely. Spot metal practically unobtainable. San Francisco wires $79.90. London, £13¾.

The prices of **Cobalt, Germanium Oxide, Lithium, Magnesium, Molybdenum, Monel Metal, Osmiridium, Osmium, Radium, Rhodium, Ruthenium, Selenium, Tantalum, Tellurium, Thallium, Tungsten,** and **Zirconium** are unchanged from the prices given in the March 7 issue.

Metallic Ores

Chrome Ore — $22.50@$23. per ton, c.i.f. Atlantic ports.

Tungsten Ore—Per unit, N. Y.:
Chinese wolframite, $10.25@$10.75.
High-grade Western scheelite, $10.50 @$11 nominal.

Iron Ore, Galena Radio Crystals, Manganese, Molybdenum, Tantalum. and **Vanadium Ores** are unchanged from March 7 quotations.

Zinc Blende Higher—Lead Ore Unchanged

Joplin, Mo., March 14, 1925

Zinc Blende	Per Ton
High	$57.80
Premium, basis 60 per cent zinc	$56.00@$57.00
Prime Western, 60 per cent zinc	$54.00
Fines and slimes	$53.00@$50.00
Average settling price, all	$53.00

Lead Ore	
High	$127.25
Basis 80 per cent lead	$115.00
Average settling price, all	$123.69

Shipments for the week: Blende, 15,275; lead, 2,289 tons. Value, all ores the week, $1,092,690.

There is reported loaded for export this week 543 tons; which added to 495 tons reported loaded last week totals 1,038 tons.

All Prime Western grades of blende were reported sold this week on a basis of $54 per ton of 60 per cent zinc. A large tonnage sold last week on the market, ostensibly to bring $53 basis, was a bone of contention on settlements, as it was considered enough ore sold last week on $54 basis to establish that as the market price. Various adjustments were made.

Lead ore continues in sharp demand on $115 basis, with shipments continuing large. Around Joplin, in old lead gouges, about 75 tons is being mined weekly.

Platteville, Wis., March 14, 1925

Zinc Blende	Per Ton
Blende, basis 60 per cent zinc	$57

Lead Ore	
Lead, basis 80 per cent lead	$115

Shipments for the week: Blende, 554 tons; lead, none. Shipments for the year: Blende, 7,458; lead, 406 tons. Shipments for the week to separating plants, 1,032 tons blende.

Non-Metallic Minerals

Diatomaceous Earth—$65, pulverized grade, $75, air float, per ton, f.o.b. mill.

Other quotations in March 7 issue.

Mica—White, dry ground, f.o.b. mill:
20 mesh, $30 per ton.
40 mesh, $50.
60 mesh, $65.
100 mesh, $80.
200 mesh, $90.
Other mica prices in March 7 issue.

Amblygonite, Asbestos, Barytes, Bauxite, Beryl, Borax, Celestite, Chalk, China Clay, Corundum, Emery, Feldspar, Fluorspar, Fuller's Earth, Garnet, Gilsonite, Graphite, Gypsum, Ilmenite, Iron Oxide, Lepidolite, Limestone, Magnesite, Manjak, Monazite, Ocher, Ozocerite, Phosphate, Potash, Pumice, Pyrites, Quartz Rock Crystals, Rutile, Silica, Spodumene, Sulphur, Talc, Tripoli, and **Zircon** are unchanged from March 7 prices.

Mineral Products

Arsenious Oxide (white arsenic)—5¾c. per lb. Meager business.

Copper Sulphate, Sodium Nitrate, Sodium Sulphate, and **Zinc Oxide** are unchanged from March 7 prices.

Ferro-Alloys

Ferromanganese—Domestic, German, and English, $115 per gross ton, f.o.b. works, or duty paid at seaport.

Ferrotungsten — Advanced to 96½c. per lb.

Ferrocerium, Ferrochrome, Ferromolybdenum, Ferrosilicon, Ferrotitanium, Ferrouranium and **Ferrovanadium** are unchanged from the prices given in the March 7 issue.

Metal Products

Rolled Copper — Sheets, 22½c.; wire, 16¾c.

Lead Sheets—11½c. per lb.

Yellow Metal, Nickel Silver and **Zinc Sheets** are unchanged from March 7 prices.

Refractories

Bauxite Brick, Chrome Brick, Firebrick, Magnesite Brick, Magnesite Cement, Silica Brick, and **Zirkite** are unchanged from March 7 prices.

Steel and Iron Lower

Pittsburgh, March 17, 1925

Steel ingot production is running only a trifle below the February rate, 89.6 per cent of capacity; January showed an 89.0 per cent rate and the last two years a 74 per cent average.

Semi-finished steel cannot be appraised at over $37 for billets and $38 for sheet bars, 50c. and $1 respectively decline from recent nominal quotations and $2 decline in sheet bars from asking prices of early January.

Pig Iron—The Standard Sanitary Manufacturing Co. has bought 8,000 tons of southern iron at $20.50, Birmingham, or $1.50 below recent asking prices, or $24.12 delivered Louisville, and 6,000 tons of southern Ohio iron at $24 delivered Louisville. The local market is quiet, with bessemer available 50c. lower than a week ago. Bessemer, $22; basic, $21; foundry, $21, f.o.b. Valley furnaces.

Connellsville Coke—Furnacemen refused to pay more than $3.50 for second-quarter coke, at which contracts have been made.

Company Reports

Homestake Mining Co.

Gold; South Dakota

Nothing has occurred during the year just passed to interrupt mining and milling the normal tonnage of ore at the Homestake mine, according to the 1924 report.

The tube mills, formerly situated in the Regrind Plant, have been moved to the Amicus Mill, some of the amalgamating plates having been removed to make the necessary room. This permits coarser crushing with the stamps and in consequence an increased tonnage, besides effecting considerable economy of operation.

After a year of continuous operation of the Ellison electric hoist, during which time 4,000 tons of ore has been hoisted per day, this installation has proved to be dependable and economical.

The engineers report as follows: Development drifts driven, 11,975 ft.; development raises driven, 3,255 ft.

There are 686,918 tons of ore broken down and remaining in the stopes and 15,815,118 tons of ore blocked out and remaining in the mine.

Balance Sheet, Jan. 1, 1924

Assets

	Jan. 1, 1924	Jan. 1, 1925
Mine, mills, power plants, and other building and rights and franchises	$29,235,684.60	$29,350,809.72
Less reserve for depreciation and depletion	8,138,318.49	8,387,601.01
	$21,097,366.11	$20,963,208.71
Balance in banks	1,42.,132.17	1,552,043.94
Balance with superintendent	44,785.64	50,287.94
Bullion in transit	318,493.34	309,910.96
U. S. Government bonds, $1,000,000 par value	999,531.25	999,531.25
Accounts receivable	435.68	846.39
General supplies as per inventory Jan. 1, 1924	589,948.25	585,488.88
Profit-and-loss account	981,519.18	981,519.18
	$25,457,211.62	$25,442,837.25

Liabilities

Capital stock—251,160 shares @ $100	$25,116,000.00	$25,116,000.00
Outstanding drafts	205,135.02	230,099.60
Accounts payable	130,975.64	91,636.69
Unclaimed dividends	5,100.96	5,100.96
	$25,457,211.62	$25,442,837.25

Statement of Operations for 1924

Revenues

Bullion	
Proceeds of bars	$6,126,349.99
Discount and interest	81,794.27
Rents	1,613.92
Miscellaneous	3,575.59
Total	$6,213,333.77

During the year 1,670,300 tons of ore was milled, realizing an average of $3.6678 per ton.

Operating Expenses

Mine account		$2,068,958.62
Diamond drilling		29,299.31
B. & M. shaft		217,978.74
Ellison shaft		222,172.76
Old Brig shaft		16,934.41
Tramway		47,998.67
Amicus mill		156,259.93
Monroe mill		35,819.38
Pocahontas mill		69,467.29
South mill operation		155,697.95
Terraville ball mill operation		2u,463.37
Regrinding		17,231.52
Cyanide No. 1		107,957.56
Cyanide No. 2		53,598.30
Slimes		129,614.20
Debris		1,305.16
Freight on bullion		16,088.04
Wolframite ore, loss on sale at less than inventory		5,138.80
Aid fund		2,020.95
Benefices		8,970.60
Pensions		36,496.32
Workmen's compensation		27,851.99
Personal injuries		700.00
Hospital		55,462.32
Recreation hall operation		31,433.14
Fire protection		5,083.04
General expense		118,494.65
Office		23,464.98
Salaries		24,000.00
House expense		8,086.02
Legal expense		15,635.83
Insurance		15,032.95
Taxes		425,589.12
Golden Gate M. & T. operation		15,573.57
Wyodak C. & M operation		20,051.76
Reverse for depreciation		730,747.55
Reverse for depletion		593,010.64
Dividends	$1,758,120.00	
Less amount paid from depletion reserve	1,074,547.67	683,644.33
	$6,213,333.77	

Ohio Copper Co. of Utah

Copper; Bingham, Utah

The 1924 annual report of the Ohio Copper Co. states that the company's financial situation was greatly improved during the year, as of the $589,758.33 profit derived from operations, and the $9,000 increased amount of capital stock outstanding (other than from the conversion of the company's bonds) $433,161.62 was invested or used in acquiring additional assets. The company's funded debt has been reduced by almost 50 per cent through the action of bondholders converting or exchanging between Nov. 14, 1924, and the end of the year, $480,600 of bonds for capital stock, leaving outstanding $519,400 of bonds, of which amount the company holds in its treasury $100,200. One dividend of 5 per cent was paid.

Statement of Operating Profits

	Production Net Pounds	Cost Per Pound	Price Per Pound	Profit Per Pound	Operating Profits
Year 1924	11,115,329	5.8150c.	12.8760c.	7.0610c.	$784,759.56
Operating profit as above					784,759.53
Miscellaneous income					2,949.16
					$787,708.69
Deductions:					
Interest on bonds etc.				$64,286.67	
Local and federal taxes, insurance and other charges				133,663.69	197,950.36
Net profits in 1924					$589,758.33
Less					
Reserve for depreciation				$36,000.00	
Reserve for depletion				140,602.53	
Years proportion of bond discount				15,021.96	191,624.49
Balance transferred to surplus					$398,133.84

Surplus Reserve Statement

Balance Dec. 31, 1923		$12,199.11
Profit transferred from 1924 operations		398,133.84
		410,332.95
Deductions		
Depreciation of old inventories	$10,000.00	
Depreciation of old plant	101,666.48	
Unamortized amount of discount on bonds converted	29,480.07	
Extraordinary repairs	20,939.96	
Dividend of 5 per cent Dec. 2, 1924	144,656.75	306,743.26
Balance—Dec. 31, 1924		$103,589.69

Balance Sheet, Dec. 31, 1924

Assets

Property account		$3,194,336.60
Investments		713,442.76
Inventory		37,296.59
Cash and cash items in transit		94,744.51
Accounts receivable		9,157.18
Prepaid items, insurance		421.78
Bond discount on outstanding bonds		31,860.06
		$4,081,259.48

Liabilities

Capital stock		$2,898,335.00
Funded debt, first-mortgage 7 per cent convertible bond issue	$1,000,000.00	
Less bonds converted into stock	480,600.00	519,400.00
Accounts payable	$54,044.31	
Accrued payrolls due Jan. 10, 1925	7,819.21	61,863.52
Reserved for taxes and interest	$36,382.97	
Reserved for contingencies	5,683.84	42,066.81
Reserve for depletion	$261,220.17	
Reserve for depreciation	194,784.29	456,004.46
Surplus		103,589.69
		$4,081,259.48

The Exploration Co., Ltd.

A report of The Exploration Co. Ltd., for 1924 shows a net realized profit of £35,328 15s. 11d., which, added to the balance of £13,550 6s. 7d. brought forward from the preceding year, makes a total of £48,879 2s. 6d. to the credit of profit-and-loss account. Out of this the directors recommend the payment of a dividend of 1s. per share, less income tax, which will absorb £27,842 5s. 3d., leaving a balance of £21,036 17s. 3d. to be carried forward to the present year.

The issued capital of the company remains the same, at £359,255 in 718,510 shares of 10s. each.

The shares and interests of the company stand in the balance sheet at £355,845 18s. 11d., being book cost. The reserve of £67,110 15s. 9d. created to provide for depreciation of investments is slightly in excess of the amount now required for that purpose.

The Tomboy mine has continued to make satisfactory profits, and development work on a limited scale has been started on the Tomboy vein.

Chief Consolidated Mining Co.

Silver, Lead; Eureka, Utah

The operations of the Chief Consolidated Mining Co. for 1924 show a production of 14,194 oz. of gold, 2,536,417 oz. of silver, 21,831,084 lb. of lead, 893,963 lb. of copper and 49,462 lb. of zinc yielding a net smelter return of $357,556.67.

Balance Sheet, Dec. 31, 1924

Assets

Property		$4,085,556.03
Mine investments		626,050.18
Current assets:		
Accounts and bills receivable	$157,229.41	
Subsidiary co.'s balances	259,233.13	
Inventories	33,730.55	
Miscellaneous	20,040.08	
Liberty bonds investment	345,786.71	
Cash	82,935.71	
		898,955.59
		$5,610,561.80

Liabilities

Capital stock:		
1,500,000 shares @ $1	$1,500,000.00	
Less stock in treasury	498,711.00	
		$1,001,289.00
First mortgage bonds		750,000.00
Stock premium	219,531.82	
Less bond discount and expense	46,869.49	
		172,662.33
Surplus Dec. 31, 1923	$2,572,477.63	
Profits		
Gross receipts from sales of ore, lime products and other materials	$2,233,743,32	
Less operating costs and for reserves for taxes and profit and loss items but exclusive of depletion charges	1,908,968.07	
Operating profit	$324,775.25	
Interest on investments and deposits	32,781.42	
Total net income	$357,556.67	
Less dividends Nos. 39 and 40	199,275.80	158,280.87
		2,730,758.50
Current Liabilities		
Accounts payable	$95,436.21	
Labor and unclaimed wages	40,169.52	
Unclaimed dividend checks	1,741.35	
Provo commercial and savings bank	1,314.94	
		138,662.02
Reserve accounts, taxes, depreciation		817,189.95
		$5,610,561.80

The results of the last year were much impaired by the character of the ore occurring in the product for the first half of the period. This ore was much poorer than usual and the profitable results of the year as a whole were restricted by the unusual expenses incident to the construction of the new concentrating plant, together with the existence of an unfavorable smelting contract. The latter has been replaced by one of a more favorable character.

The concentrator has been completed and all the expenses pertaining thereto have been paid, and the character of the ore for the last six months and now continuing is of very much improved quality.

Shattuck Arizona Copper Co.

Though the mine of the Shattuck Arizona Copper Co. was operated continuously during 1924, because of the low price of copper metal only a small copper tonnage could be mined at a profit. The development work during the year amounted to $2.13 per ton of copper ore mined. However, on account of the small tonnage mined, the amount of development work was not sufficient to open up the ground that must be prospected, and, beginning the first part of January, 1925, the amount of development work will be doubled. Copper is delivered to Shattuck Arizona in New York by the A. S. & R. Smelting Co., and sales in 1924 totaled only 954,000 lb., at an average price of 14.273c., leaving 4,899,394 lb. of unsold copper on hand, which is carried at cost. A total of 2,630,185 lb. was produced in 1924.

The production of lead is dependent upon the requirements of the El Paso smelter, as well as the market price for metal. The lead stopes are in heavy and caved ground and are costly to operate. The lead is sold to the smelter at current metal prices as of the date of sampling and the average price received for lead produced in 1924 was 7.973c. per lb. The profit made on the lead for the year is offset by charge for deferred development accrued prior to 1924. Lead output amounted to 5,244,526 lb.

Income Account for the Year Ended Dec. 31, 1924

Gross income		$1,219,011.17
Mining development, refining and marketing	$978,965.31	
Deferred development	75,060.53	
General expenses and taxes	24,898.81	1,078,924.65
Net income		$140,086.52
Depletion	$127,803.79	
Depreciation	2,061.52	129,865.31
Net profit, carried to surplus		$10,221.21

Surplus Account

Balance, Dec. 31, 1923	$206,940.58	
Less charges applicable to prior years	28,969.56	$177,971.02
Net profit for 1924		10,221.21
Balance, Dec. 31, 1924, carried to balance sheet		$188,192.23

Balance Sheet, Dec. 31, 1924

Assets

Mining property	$8,349,015.62	
Less depletion reserve	2,801,357.98	$5,547,657.64
Buildings, plant and equipment	$587,280.79	
Less depreciation reserve	383,710.77	203,570.02
		$5,751,227.66
Deferred charges for development		25,020.18
Current assets		1,830,133.69
		$7,606,381.53

Liabilities

Capital stock	$3,500,000.00
Property surplus	3,839,015.62
Current liabilities	59 173.69
Reserve for accidents	20,000.00
Surplus from operations	188,192.23
	$7,606,381.53

National Lead Co.

A statement of the net earnings of the National Lead Co., for 1924 follows:

Surplus, Dec. 31, 1923		$24,698,339.83
Net earnings for 1924, after deducting all expenses, reserves, and other charges		4,454,978.64
		$29,153,318.47
Less dividends:		
Dividends on preferred stock at rate of 7 per cent	$1,705,732.00	
Dividends on common stock at rate of 8 per cent	1,652,432.00	3,358,164.00
Surplus, Dec. 31, 1924		$25,795,154.47

A comparison with the preceding year is given in the following statement:

Assets

	Dec. 31, 1924	Dec. 31, 1923
(a) Plant investment	$41,983,252.63	$43,058,131.98
Other investments	10,846,683.99	11,010,316.23
Inventories	18,483,875.43	19,403,510.18
Accounts receivable	18,559,107.01	16,319,558.11
Notes receivable	500,001.00	578,013.50
Cash	5,288,656.21	3,565,350.67
Total assets	$95,261,576.27	$93,934,880.67

(a) Net

Liabilities

	Dec. 31, 1924	Dec. 31, 1923
Preferred stock	$24,367,600.00	$24,367,600.00
Common stock	20,652,400.00	20,652,400.00
Bonds of subsidiaries	7,318,000.00	7,731,000.00
Insurance reserve	3,189,926.80	2,880,009.91
Employer's liability reserve	283,186.77	261,506.11
Plant reserve	2,500,000.00	2,500,000.00
Promotion reserve	1,500,000.00	1,500,000.00
Metal reserve	1,000,000.00	1,000,000.00
Tax reserve	3,663,199.06	4,416,330.85
Accounts payable	4,989,109.17	3,924,693.97
Notes payable		
Surplus	25,795,154.47	24,698,339.83
Total liabilities	$95,261,576.27	$93,934,880.67

Mining Stocks

Week Ended March 14, 1925

Stock	Exch.	High	Low	Last		Last Div.
COPPER						
Alaska-Br. Col.	N. Y. Curb			*6		
Anaconda	New York	42⅜	39⅝	40	Ja.17, Fe.16,	0.75
Arcadian Consol.	Boston	1⅜	1 1/16	1⅜		
Ariz. Com'l.	Boston	12⅛	11⅝	11⅝	Ja. 19, Ja. 31	0.50
Calaveras	N. Y. Curb			1⅛		
Calumet & Arizona	New York	51½	50½	51	Mh.6, Mh.28 Q	0.50
Calumet & Hecla	Boston	15⅜	15	15	Ja.30, Mh.4	0.50
Canario Copper	N. Y. Curb	4	3⅞	4		
Cerro de Pasco	New York	51½	48⅜	48⅛	Ja. 22, Fe. 2, Q	1.00
Chile Copper	New York	35⅞	33⅛	33⅛	Mh.3,Mh.20, Q	0.62½
Chino	New York	23½	22⅛	22⅛	Sept., 1920	0.37½
Con. Coppermines	N. Y. Curb	3⅜	3⅛	3⅛		
Copper Range	Boston	27	24⅛	24⅛	May, 1924	1.00
Crystal Copper	Boston Curb	*65	*61	*62		
Davis-Daly	Boston	*8	*7	*7	Mar., 1920	0.25
East Butte	Boston	4¼	4⅛	4⅛	Dec., 1919	0.50
First National	Boston Curb	*24	*24	*24	Feb., 1919	0.15
Franklin	Boston	1	1	1		
Gadsden Copper	Boston Curb	*65	*60	*65		
Granby Consol.	New York	18⅛	17⅜	17⅞	May, 1919	1.25
Greene-Cananea	New York	16	14⅞	14⅞	Nov., 1920	0.50
Hancock	Boston			1⅛		
HoweSound,new,r.t.c.	N. Y. Curb	21⅛	19⅛	19⅛	April 1924	0.05
Inspiration Consl.	New York	27⅝	25⅛	26	De.20, Ja.7, Q	0.50
Iron Cap	Boston Curb	2⅜	2⅛	2⅛	May, 1923	0.15
Isle Royale	Boston	16⅛	15⅛	15⅛	Sept. 1923	0.50
Jerome Verde Dev.	N. Y. Curb	1⅞	1 3/16	1⅞		
Kennecott	New York	52¾	49¾	51	Mh.6, Ap.1, Q	0.75
Keweenaw	Boston			*75		
Lake Copper	Boston			2⅜		
Magma Copper	New York	40⅝	36⅞	38⅛	Jan., 1919	0.50
Mason Valley	N. Y. Curb	1⅝	1⅜	1⅜		
Mass Consolidated	Boston	*80	*80	*80	Nov., 1917	1.00
Miami Copper	New York	13⅛	10⅛	13⅛	Fe.2 Fe.16 Q	0.50
Mohawk	Boston	34	31	33	Ja. 13, Mh. 2	1.00
Mother Lode Coa.	New York	7⅞	7⅜	7⅛	De. 12, De. 31	0.37½
Nevada Consol.	New York	14⅞	13⅜	14	Sept., 1920	0.25
New Cornelia	Boston	22⅛	21⅛	21⅛	Fe. 6, Fe. 23	0.25
New Dominion	Boston			*70		
North Butte	Boston	2	1⅛	1⅝	Oct., 1918	0.25
Ohio Copper	N. Y. Curb	1 1/16	*90	*90	No.14, De.2	0.05
Old Dominion	Boston	22⅜	21	21	Dec., 1918	1.00
Phelps Dodge	Open Mar.	†122	†118		Mh 20, Ap.2 Q	1.00
Quincy	Boston	29	25½	25⅞	Mar., 1920	1.00
Ray Consolidated	New York	15	13½	14	Dec., 1920	0.25
Ray Hercules	N. Y. Curb			*8		
St. Mary's Min. Ld.	Boston	39½	35½	36	May 1924	3.00
Seneca Copper	New York			⅛		
Shannon	Boston	*65	*65	*65	Nov., 1917	0.25
Shattuck Arizona	New York	6	5⅜	5⅜	Jan., 1920	0.25
Superior & Boston	Boston	1⅜	1⅜	1⅛		
Tenn. C. & C.	New York	8⅜	8⅛	8⅜	De.31, Ja.15,Q	0.25
United Verde Ex.	N. Y. Curb	25¼	25⅛	25⅜	Ja. 2, Fe. 2	0.50
Utah Copper	New York	87⅛	86	86⅛	Mh.20,Mh.31,Q	1.00
Utah Metal & T.	Boston	*75	*61	*70	Dec., 1917	0.30
Victoria	Boston			*60		
Walker Mining	Salt Lake	3 32½	3 15	3 32½		
Winona	Boston			*16		
NICKEL-COPPER						
Internat. Nickel	New York	26¾	26	26⅜	March, 1919	0.50
Internat. Nickel pfd.	New York	97½	97½	97½	Ja. 15, Fe. 2, Q	1.50
LEAD						
Carnegie Lead & Zinc	Pittsburgh	8	7	7⅛		
Gladstone M. M. Co.	Spokane	*20½	*17½	*20	Mh.5, Mh.10,	0.00½
National Lead	New York	158⅛	153⅛	153½	Mh.13,Mh.31,Q	2.00
National Lead pfd.	New York	117⅜	117⅜	117⅛	Fe.2, Mh.14, Q	1.75
St. Joseph Lead	New York	51½	42½	50⅜	Mh. 5, Mh. 20	0.50
ZINC						
Am. Z. L. & S.	New York	9⅛	8½	8⅛	May, 1920	1.00
Am. Z. L. & S. pfd.	New York	31½	27⅛	27⅛	Nov., 1920	1.50
Butte C. & Z.	New York	7⅛	6⅜	6⅜	De.10, De.24	0.50
Butte & Superior	New York	20⅞	18⅜	19	Mh.19, Mh.31	0.50
Callahan Zn-Ld.	New York	4	3⅜	3⅝	Dec., 1920	0.50
New Jersey Zn.	N. Y. Curb	197⅞	190	191½	Ja.20, Fe.10	2.00
United Zinc	N. Y. Curb	*35	*35	*35		
Yellow Pine	Los Angeles	*72½	*71½	*71½	De.10,De.15 Q	0.04
SILVER						
Alvarado	Boston Curb			2	Oct. 1920	0.50
Beaver Consol.	Toronto	*33½	*32½	*33½	May, 1920	0.03
Castle-Trethewey	Toronto	*84½	*80½	*83		
Coniagas	Toronto			2.00	May, 1924	0.12½
Keeley	Toronto	2.11	2.01	2.06	Mh.1, Mh.15SA	0.12
Kerr Lake	N. Y. Curb	1⅜	1⅜	1⅜	Ap.1, Ap.15, Q	0.12½
La Rose	Toronto	*42½	*40	*41½	Apr., 1922	0.10½
Lorrain Trout Lake	Toronto	1.30	1.17	1.25	Ap. 15, '25	0.05
McKinley-Dar.-Sav.	Toronto	*37	*34½	*35½	Oct., 1920	0.03
Mining Corp. Can.	Toronto	2.74	2.65	2.70	Sept., 1919	0.12½
Nipissing	N. Y. Curb	6⅜	6⅛	6⅜	Ja.18,Ja.20,QX	0.30
Ontario Silver	New York			7	Jan., 1919	0.50
Temiskaming	Toronto	*26	*20	*23½	Jan., 1920	0.40
GOLD						
Alaska Juneau	New York	1⅜	1⅛	1⅜		
Argonaut	Toronto	*38	*35½	*36		
Carson Hill	Boston	*37	*35	*35		
Consol. W. Dome L.	Toronto	*17⅞	*16½	*17		
Cresson Consol. G.	N. Y. Curb	3⅞	3 11/16	3⅞	De.31, Ja.10 Q	0.10
Crown Reserve	Toronto	*44½	*42½	*44	Jan. 1917	0.05
Dome Mines	New York	15½	13⅛	13⅜	De.31, Ja.20, Q	0.50
Golden Cycle	Colo. Springs	1.50	1.50	1.50	Dec.11, 1924	0.03
Hollinger Consol.	Toronto	14.41	13.65	14.40	Mh.20,Mh.25M	0.05
Homestake Mining	New York	45	43⅞	44⅛	Mh.20,Mh.25,M	0.50
Jib. Consol,	N.Y. Curb	*26	*11	*12		

Stock	Exch.	High	Low	Last		Last Div.
Kirkland Lake	Toronto	*45½	*44½	*44½		
Lake Shore	Toronto	5.82	5.70	5.70	Mh.2, Mh.16,	0.05
McIntyre-Porcupine	New York	17½	17¼	17½	Fe.2, Mh.2,	0.25
Newray	Toronto	*26½	*24	*25½		
Night Hawk Pen.	Toronto	*26	*25	*25		
Portland	Colo. Springs			*45	Oct., 1920	0.01
Rand Mines	New York			35½	Fe.17, Fe.25	1.79
Teck-Hughes	Toronto	1.47	1.39	1.45		
Tom Reed	Los Angeles	*71	*65	*65	Dec., 1919	0.02
Tough-Oakes	Toronto	*36	*34½	*35½		
United Eastern	N. Y. Curb	*53	*50	*52	July, 1924	0.05
Vipond Cons.	Toronto	1.27	1.22	1.25		
Wright-Hargreaves	Toronto	4.65	4.50	4.50	Mh.16,Ap.1,QX	0.05
GOLD AND SILVER						
Black Oak	N. Y. Curb			*81		
Con. Cortez	N. Y. Curb			*20		
Con. Virginia	San Francisco	*7	*5	*7		
Continental Mines	N. Y. Curb			1¼		
Dolores Esperanza	N. Y. Curb	*70	*55	*70	July, 1923	0.05
Premier Gold	N. Y. Curb	2½	2 5/16	2⅜	Mh.23, Ap.3,	0.08
Tonopah Belmont	N. Y. Curb	*75	*61	*61	Mh.15, Ap.1	0.05
Tonopah Divide	N. Y. Curb	*26	*26	*26	Se. 22, Oc. 10	0.10
Tonopah Extension	N. Y. Curb	2⅞	2½	2¼	Mh.11, Ap.1, Q	0.05
Tonopah Mining	N. Y. Curb	1⅝	1⅝	1⅝	Fe. 12,Fe. 25,	0.50
Unity Gold	N. Y. Curb	*51	*50	*50		
West End Consol.	N. Y. Curb			*30	Mar., 1923	0.05
Yukon Gold	N. Y. Curb			*35	June, 1918	0.02
SILVER-LEAD						
Ahumada	Boston Curb	12⅛	10⅜	11⅛	Mh.16, Ap.2,X	0.25
Bingham Mines	Boston	32⅛	30¼	31	Mh.20, Mh.31	0.50
Cardiff M. & M.	Salt Lake	1.35	1.25	1.35	De.16, No.18	0.10
Chief Consol.	Salt Lake	4.00	4.00	4.00	May, 1924	0.10
Columbus Rexall	Salt Lake	*25	*20	*20	Aug., 1923	0.05
Erupcion	Boston Curb	3⅛	2⅝	3	Mh.16, Ap.2,X	0.20
Federal M. & S.	New York	17⅛	15¼	15½	Fe.26, Mh.15 Q	1.75
Federal M. & S. pfd.	New York	52¾	49½	50½	No.25, De.15,	1.75
Florence Silver	Spokane	4⅞	4	4⅛	Apr., 1919, QX	0.01
Hecla Mining	N. Y. Curb	16¼	15⅞	15⅞	Fe.15, Mh.15	0.50
Iron Blossom Con.	Salt Lake	*34	*33	*33	Oc.25, 1924	0.01½
Iron King Mining	Salt Lake	*74	*69	*70		
Keystone Mining	Salt Lake	*73	*69	*69		
Mammoth Mining	Salt Lake	1.82½	*95	1.82½		
Marsh Mines	N. Y. Curb			*5	June, 1921	0.02½
Park City	Salt Lake	5.30	5.25	5.25	Mh.14, Ap.1	0.15
Park Utah	Salt Lake	*27½	*24	*26½	April, 1924	0.15
Prince Consol.	Salt Lake	*32	*25	*25½		
Silver King Coal	Salt Lake	6.80	6.70	6.75	De.20, Ja.2, Q	0.20
Silversmith	Spokane	*28	*28	*28	Ja. 1, Ja. 10	0.02
Tamarack-Custer	Spokane	*73	*70	*72	Se. 22, Se. 29	0.25
Tintic Standard	Salt Lake	9.00	8.85	8.95	Mh.23, Mh.30	0.40
Utah-Apex	Boston	6¼	5⅞	6¼	Ja.10, Ja.15,	0.25
IRON						
Bethlehem Steel	New York	46	43	44⅜	Jn.1, Jy.1, Q	1.25
Char. Iron	Detroit	*35	*35	*35		
Char. Iron pfd.	Detroit	*85	*85	*85		
Colorado Fuel & Iron	New York	44½	42	43⅛	May, 1921	0.75
Gt. North'n Iron Ore	New York	37½	36½	36¼	De.10, De.27	2.00
Inland Steel	New York	46	45	45	Fe.14, Mh.20 Q	0.625
Mesabi Iron	N. Y. Curb	3⅛	3⅛	3⅛		
Replogle Steel	New York	19	17⅛	17⅜		
Republic I. & S.	New York	56⅛	52⅛	54⅛	May, 1921	1.50
Republic I. & S. pfd.	New York	90	88⅛	90	Mh.8, Ap.1, Q	1.75
Sloss-Sheffield S. & I.	New York	90⅝	87⅝	87⅞	Mh.10, Mh.20	Q 1.50
Sloss-Shef. S.&I. pfd.	New York			97	Mh.20, Ap.2, Q	1.75
U. S. Steel	New York	124⅛	122⅜	123⅞	Fe.28,Mh.30,QX	1.75
U. S. Steel pfd.	New York	123⅝	122½	123⅜	Fe.1, Fe.27, Q	1.75
Virginia I. C. & C.	New York			40	De.15, Ja.2	1.50
Virginia I.C.&C.pfd.	New York			75	De. 13, Ja. 2, Q	2.50
VANADIUM						
Vanadium Corp.	New York	28⅜	26¼	27⅛	Jan., 1921	1.00
ARSENIC						
Western Utah Copper	N. Y. Curb	*17	*17	*17		
ASBESTOS						
Asbestos Corp.	Montreal	44½	41	44	Fe.1, Fe.15 Q	2.00
Asbestos Corp. pfd.	Montreal	88½	87⅞	88½	Ap.1, Ap.15, Q	1.50
SULPHUR						
Freeport Texas	New York	9¼	8½	8⅝	Nov., 1919	1.00
Texas Gulf	New York	113¾	106¾	112	Mh.2, Mh.14,	1.75
DIAMONDS						
De Beers Consol.	New York			22⅜	Ja.6, Fe.2	0.95
PLATINUM						
So. Am. Gold & P.	N. Y. Curb	3⅛	3	3		
MINING, SMELTING AND REFINING						
Amer. Metal	New York	49⅞	48⅜	48⅝	Fe.18, Mh.2 Q	0.75
Amer. Metal pfd.	New York			114½	Fe.19, Mh.2, Q	1.75
Amer. Sm. & Ref.	New York	99⅜	96⅛	97⅝	Ja.16, Fe.2, Q	1.50
Amer.Sm.&Ref.pfd.	New York	108⅛	108	108	Fe.6, Mh.2 Q	1.75
Consol. M. & S.	Montreal	70¼	68	69½	De.11, Ja.15 SA	0.75
Federated Metals	N. Y. Curb			37⅛		
Southwest Metals	N. Y. Curb			*75		
U. S. Sm. R. & M.	New York	34	31⅞	33⅛	Jan., 1921	0.50
U.S. Sm. R.&M.pfd.	New York	45	44⅞	44⅞	Ja.8, Ja.15	0.87½

* Cents per share. † Bid or asked. Q, Quarterly. SA, Semi-annually. M, Monthly. K, Irregular. I, Initial. X, Includes extra. The first date given is that of the closing of the books; the second that of the payment of the dividend.

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